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TWENTY-THIRD ANNUAL REPORT

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OF THE

STATE BOARD OF AGRICULTURE

OF THE

STATE OF MISSOURI,

FOR THE

YEARS 1890-91.

JEFFERSON CITY, MO.:
TRIBUNE PRINTING COMPANY, STATE PRINTERS AND BINDERS.
1891.

M. M. Fisher

M. M. FISHER, D. D., LL. D.

Acting President of the State University and Member State Board of Agriculture.

———o———

It is a pleasure to present in this volume an excellent portrait of the late Dr. Fisher, who, at the time of his death, February 20, 1891, was a member of the State Board of Agriculture.

His ever prompt and interested attention in the business meetings of the Board, and the unvarying courtesy and consideration for the feelings and opinions of others, endeared him to the other members of the Board.

Dr. Fisher was universally beloved because of his interest in living, breathing humanity; in the University it was the boys and girls, and not alone the institution, to which he was devoted.

He believed in the preponderance of good in human nature, and trusted and loved his students; and under his influence all the good in a boy came to the surface. He possessed to a remarkable degree the faculty of remembering names, and the habit of cordially shaking a hand and distinctly calling the name did much to establish cordial relations between the professor and his pupils. To the development of the boys physically, mentally and spiritually every energy was exerted, and the students knew he never would be too tired or too busy to give sympathetic attention and wise, encouraging counsel.

In the loss of Dr. Fisher the Board of Agriculture mourns an earnest and willing worker and true friend.

STATE BOARD OF AGRICULTURE.

MEMBERS EX OFFICIO.

His Excellency, D. R. Francis.
Hon. L. E. Wolfe, Superintendent of Public Schools.
M. M. Fisher, D. D., Acting President of Missouri State University.
E. D. Porter, Dean of State Agricultural College.

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ANNUAL REPORT OF THE SECRETARY.

To the General Assembly of the State of Missouri:

The law governing the State Board of Agriculture makes it the duty of the Board to make an annual report of its proceedings.

There being only biennial sessions of the Legislature, it is necessary to report more than one year's work to your honorable body. A full report for two years connot be made, from the fact that the year's work does not end until March 1.

We have, therefore, to submit to you the accompanying report for the year ending March 1, 1890, and the following statement of the present year's work up to date.

STATE VETERINARY SERVICE.

Early in March, 1890, the Board of Agriculture was summoned to Jefferson City by his Excellency, Governor Francis, at the instance of the State Veterinarian, to assist in drafting quarantine regulations to prevent the spread of Texas fever among cattle.

Doubtless Dr. Paul Paquin has reported to you his efforts in enforcing the regulations. With that the Board of Agriculture has nothing to do.

Under the present veterinary law its connection with the veterinary work of the State is limited to assisting in drafting quarantine regulations. The Board of Agriculture cannot but regard the veterinary service, so far as it is for the control of animal diseases, being of such paramount interest and importance to the live-stock industry, as logically and properly in the line of the work of the Board. Therefore, the recommendation made in his annual message by his Excellency, the Governor, that the service be transferred from the control of the Board of Curators of the State University to the State Board of Agriculture, is indorsed.

MONTHLY CROP REPORTS.

During March, 1890, the work of making monthly crop reports was begun for the season. The first report was issued on the first of April, and on the first of each month thereafter until November. Seven thousand (7,000) copies of each of the April and May reports were printed in sheet form, in connection with the map of the State in colors, and sold to local newspapers for use by them as supplements. The funds of the Board not being sufficient to meet the cost of printing so many copies of the reports, a price covering this cost was charged the papers. Other months' reports, up to October 1, were issued in editions of ten thousand (10,000) copies in supplement form, but without the map, and distributed to different papers without charge, the cost being met from advertising space. Of the November report, which was the last of the season, fifty thousand (50,000) copies were issued and distributed to the farmers through the local papers of the State. The cost of the edition was two hundred and fifty (250) dollars. Copies of the reports are submitted herewith.

The work connected with these monthly crop reports consumes a good portion of each month. The preparation of circulars sent to correspondents calling for information regarding the acreage, condition, price and prospective yield of the different crops, number, condition and price of live stock, existence of animal diseases, prevalence of injurious insects, etc., etc., mailing them to the large corps of correspondents, tabulating the returns, involving several thousand sets of figures, reading the correspondents' remarks, and from these and the figures making up the report for the printer, reading proof and remailing the report to correspondents and to the papers of the State, leaves little time for other matters. It is, however, a line of work which is very beneficial, and can be made yet more so to the farmers. Complete, reliable and early information is one of the demands of the times in all lines of business, but of all the industries of our land agriculture is at the greatest disadvantage in this respect, in not having adequate means of learning the prevailing conditions which will affect the price of its products. It is this lack of early and comprehensive information, more than all things else, that makes it necessary for the farmer to take for his products what is offered. If he could at all times know the condition of the market in season to limit his products to what is in demand, he would be in position to command a price for what he has to sell.

To make the system of crop reporting most serviceable to the farmers, the Board of Agriculture needs more funds with which to employ assistance in gathering the data and putting it in shape for publication, and with which to widely disseminate the information gathered among those for whom it is intended.

The most effective means of disseminating the crop information is by publishing, in supplement form, for the use of local newspapers, the plan that was followed, to a limited extent, during the past season. The copy of the November crop report submitted herewith is self-explanatory. With twenty-five hundred (2,500) or three thousand dollars to meet simply the cost of printing seventy-five thousand (75,000) to one hundred thousand (100,000) copies of each month's report to be distributed by the local press, the great mass of the farmers of the State would be put in possession of the information at the disposal of the Board of Agriculture. By no other possible means could this be accomplished short of one hundred times the cost. Information worth expending time and ability in collecting should be put into the hands of those for whom it is intended, and with the immense amount of work already devolving on the Secretary of the Board, he should not be expected to take time to solicit advertising to provide funds with which to publish the reports.

It is a pleasure to record that the press of the State has shown a most commendable disposition to co-operate with this Department in its efforts to keep the agriculturists informed, and all the supplements we could afford were promptly distributed.

A further requirement are facilities for getting more exact data. The corps of correspondents of the Board of Agriculture comprises leading and the most intelligent farmers in every county of the State. They have exerted themselves to secure full and accurate information, and it gives pleasure to commend their intelligent efforts in behalf of their fellow-farmers. While the information thus obtained is valuable and is recognized as the best available, it is only approximate. There should be more authoritative means of gathering farm statistics. The plan recommended by the Board is in successful operation in other States, and seems the most feasible that can be devised.

COUNTY ASSESSORS TO MAKE RETURNS.

It is one by which county assessors shall be required to gather farm statistics. Blank forms and schedules, prepared under the direction of the Secretary of the State Board of Agriculture, can be furnished the assessors through the county clerks, and little extra time be required when making assessments to list the acreage and yield per acre of the different crops grown during the season.

These forms returned to the office of the State Board of Agriculture would be a valuable source of information. Many letters are received every season from buyers, asking in what counties certain crops can be obtained and in what quantities. With the information at hand, buyers and sellers of farm products can be brought together with mutual advantage. Hardly a season passes without the loss of large quantities of different products, simply because the grower did not know where to find a market, and those who wanted them did not know where to find them. This is the case particularly with the first attempt at growing crops not hitherto grown in that locality. It often happens that efforts to diversify farming operations meet with discouragement and are abandoned, simply from failure to find a market, when otherwise all the conditions are favorable for success. Such information would also afford the best possible means of preventing dealers and speculators in farm products manipulating prices as is now done, to the disadvantage of the producer and consumer of the products.

With exact information as to the total output of the crops of the State at the command of the Secretary of the State Board of Agriculture, it would be impossible for any body of men to elevate or depress prices beyond the limit that actual supply and demand will fix. Furthermore, if the farmers can be informed as to the actual product of the State and the probable demand, they can limit their acreage in the various crops to meet the requirements, and not, as is now often the case, plant a large area of certain crops of which there is already an overplus, and neglect those for which there is a growing demand.

STATE WEATHER SERVICE.

The establishment of a meteorological bureau in connection with this Department has rendered a wider range of work possible, and the observations carried on in conjunction with other work have proved of value in many ways. The study of climatic conditions is indispensable to a complete study of soil conditions and of animal and plant life. During the thirty-two weeks of the past crop season, there was issued from this office a weekly

WEATHER CROP BULLETIN,

Giving prevailing climatic conditions and crop prospects in all parts of the State. Copies of these bulletins were mailed to the daily and agricultural papers of the State, to one local paper in each county and to each of the voluntary observers. Fifteen thousand (15,000) copies were thus distributed.

It is hoped that means will be provided for the further extension of this work. There should be located in every county of the State a set of maximum and minimum thermometers, a rain-gauge, instruments for measuring the velocity of the wind, and other instruments with which a more perfect study of weather conditions may be made. The system of frost and cold-wave warnings should be greatly extended.

It is only just that due credit be given the present observer for the efficient work done, and the thanks of the Board of Agriculture be tendered the United States Signal Service for providing service which is proving of such aid in the work of this Department.

THE SEASON'S CROPS.

A careful review of the events of the past year, through the statistical records, indicates the yield per acre to have been less than an average for all staple crops, but the table of summaries given herewith proves that the decrease in yield has been more than offset by the increase in price, and the seven leading crops were worth on the market to the producer seventeen million (17,000,000) dollars more than the same crops for 1889.

TABLE OF SUMMARIES.

Showing acreage of staple crops in the State, yield per acre in bushels, tons or pounds, and price, with the total valuation.

	Acres.	Yield per acre.	Total yield.	Price per bu., lb. or ton.	Total valuation.	Total valuation 1889.
Corn	6,470,000	25.00	161,750,000	$ .385	$62,273,750	$50,330,000
Wheat	1,600,000	11.60	18,560,000	.84	15,790,400	14,720,000
Oats	1,380,000	17.00	23,346,000	.34	7,976,400	6,950,000
Hay	1,590,000	1.37	2,146,500	6.78	14,553,270	11,700,000
Flax	45,000	9.00	405,000	1.15	465,750	396,000
Tobacco	12,000	744.00	8,922,000	.083	696,024	557,000
Potatoes	85,000	36.50	3,102,500	.91	2,823,275	2,138,000
	11,182,000	....	....	....	$104,578,869	$86,791,000

The wheat crop of the State was injured by spring frosts, the total product being only slightly greater on an increased area, but the quality was never before equaled on Missouri soil.

The oat crop met disaster in the Grain Aphis *(Siphonophora avenæ)* in almost half the State, reducing the yield fifteen million (15,000,000) bushels.

The corn crop had unfavorable development. The drouth and high temperature of the summer would have reduced the yield, but being supplemented in some parts of the State by heavy and long-continued rains, followed by early frost, materially impaired the quality, the average for the State being 83, against 95.6 last season.

APPRECIATION OF THE AGRICULTURAL INTEREST.

There is evidence throughout the State of a growing appreciation of the importance of the interest the Board of Agriculture is designed to serve. There is a constant demand from all classes for the facts of production and distribution, prices of products, and development of resources. The large and rapidly-increasing correspondence with farmers, touching almost every topic connected with farm theory and practice, together with the views of the farmers themselves, made known at the recent series of Farmers' Institutes, is a gratifying proof that the farmers are anxious to avail themselves of the work of this Department, and the earnest and increasing demand for enlightenment proves that they recognize that information lies at the foundation of successful agricultural work.

The peculiar circumstances of our agricultural people, and the lack of facilities for obtaining information relating to their business, make it the imperative duty of the Board to supply this lack by being a bureau of information on all subjects relating to agriculture—from the weather and crops to the ravages of the most minute insect and injurious fungi.

An earnest effort has been made in this direction during the past year, but the very limited facilities for carrying forward the work have much hampered the effort to carry out, even in part, the measures indicated in the last report as essential to the perfectly efficient reorganization of the department.

AGRICULTURAL EDUCATION.

The Board of Agriculture is linked by law with the public school system of the State, through the State Superintendent of Public Schools, the President of the State University, and the Dean of the Agricultural college, who are *ex officio* members of the Board, and in view of this connection is required to make in its report to your honorable body "such recommendations, including especially such a system of public instruction on these subjects (agriculture and horticulture), as may be deemed interesting and useful."

The agriculturists have certainly a right to be interested in the public schools, for, to a large degree, they are dependent on the country district schools for the education of their children.

The farmers are manifesting their interest in school matters by urging legislation which will reduce the cost of school text-books; but is that all they are justified in asking? When it is considered that the vast majority of the future farmers of the State are entirely dependent on the country schools for their school education, would they not be justified in demanding that the course of study be somewhat adapted to a farmer's need?

The primary purpose in giving a child an education is to fit him the better for gaining a living, and the mode in which he is to earn his living should be in the minds of those who shape the course of study and of the teachers of the children. It is not intimated that in the country schools the industry of agriculture should be given exclusive attention, for the education given in these schools is fundamental, and should be such that varying superstructures may be built upon it; but is it impossible or impractical to so shape the course of study that a trend of thought may be given toward the farm rather than away from it as now, and that ideas and facts may be given which will have a practical application of value in farm operations? The demand of the times is for more practical education—one which will best fit a young man for the calling in life he is likely to follow, and which will enable him to engage successfully in this calling as soon as he leaves the school-room, without the necessity of unlearning all that has been taught him, and acquiring practical ideas by the slow and costly processes of experience. The tendency is to shape college courses to meet the demand, but thus far it does not seem to have occurred to educators in and superintendents of public schools that the business of farming is of sufficient magnitude and difficulty to make it necessary that those engaged in it should be given the advantage of any special training.

If the Legislature sees fit to put the work of preparing and printing text-books into the hands of a commission, should not the farmers, comprising as they do so large and important a part of the population of the State, be given, through the State Board of Agriculture, a voice as to the character of the books to be adopted?

It is beyond dispute that farming, intelligently pursued, calls into play a wider range of knowledge, more of the arts and sciences, than does any other calling of the day. It demands the application of the same careful business methods that must accompany the successful merchant or manufacturer.

In recognition of these facts, the Board of Agriculture has undertaken to gather and disseminate among the farmers of the State as much useful information as possible, and to bring about better methods of farming.

THE FARMERS' INSTITUTE

Is the most effective means of accomplishing these purposes. During the present winter twenty-eight institutes have been held in as many counties of the State, at points from which came invitations to the Board to hold meetings. As many were held as the funds would allow, and, to meet the demand as fully as possible, only one day was allowed for a meeting, but much more good could be done if not less than two days could be spent in a place; for the number of subjects the farmers want to have discussed cannot be handled in a satisfactory manner in less time. These meetings are attended by the best agricultural thought and practice of the community in which they are held, and afford the best means of learning the views and needs of the people. Free discussion of all topics, such as dairying, stock-feeding, sheep-raising, fruit-growing, bee-keeping, are had, resulting in bringing out from the regular speakers and the farmers present much valuable information.

This line of work is becoming very popular with the farmers, and they ask that more funds be placed at the disposal of the Board for its extension. Five thousand (5,000) dollars per year is needed with which to carry on the work in an effective manner.

That is not more than half what is spent in other States in this line of work with excellent results. Very few of the farmers of the State will have the advantage of attending any school where agriculture is taught, but a well-sustained system of farmers' institutes will do much to meet the deficiency. They are the agricultural schools, going to the farmers' homes, and the teachers are the practical and successful farmers.

MISSOURI'S RESOURCES.

Missourians are justly proud of the extent and variety of our State's natural resources. In the line of agricultural products Missouri cannot be excelled, if she can be equaled, by any other State in the Union. All of the great staples, including cotton, are most successfully grown. Of the latter more is produced per acre in cotton-growing counties than is grown in the cotton states, and of better quality. The bread that took the prize at the World's fair in Vienna was made from Missouri wheat. A bunch of Missouri beef cattle brought the highest price paid this season up to date. Ten million (10,000,000) dollars' worth of fruit has been sold from Missouri orchards this season. Our apples are of such superior quality that, where shown in competition with the fruit of other States, as has often been done, they have never failed to be awarded first honors. Our horses are fast acquiring a reputation as among the best in the land. A herd of Missouri short-horns successfully competed in all the leading show rings of the last fair season. A flock of Missouri merinos were shown at the New York fair in company with the best flocks of the country, and brought home with them the first honors. Missouri-bred hogs stand at the head. Seventy thousand (70,000) bushels of castor beans and ninety thousand (90,000) bushels of flax-seed are grown annually in single counties of the State. There is no crop grown in a temperate climate that cannot be successfully grown in Missouri.

Although ranking high in the amount of annual product, it is far short of what could easily be produced within the borders of the State. The productive capacity of the land now in cultivation can be more than doubled, and there are yet thousands of acres of rich land that has never been pressed by the plowshare.

These facts are not known as they should be to the home-seeker in other states and lands. A knowledge of them would bring to our midst large additions to our population and wealth.

THE COLUMBIAN EXPOSITION,

To be held in Chicago in 1893, will be the grandest opportunity for showing Missouri's resources that will present itself for a generation. Should not the opportunity be embraced?

One hundred thousand (100,000) dollars spent in making such an exhibit of the agricultural products and resources of the State as can be made, might easily be the means of inducing five thousand heads of families to locate within her borders, and add ten dollars to the wealth of the State for every one of outlay.

In July last, the Secretary of the Board of Agriculture was called to Chicago to attend a meeting of dairymen held for the purpose of considering means and methods of making an exhibit of dairy products at the Exposition. Being made one of the Executive committee of the Columbian Dairy Association, charged especially with the work of securing a creditable exhibit of dairy products, steps were taken to get the dairy interests of the State organized. To that end, a call was issued in September to the dairymen of the State to meet in Kansas City for the purpose of forming

A STATE DAIRYMEN'S ASSOCIATION.

A preliminary organization was effected, the first annual meeting being held January 15–16, 1891, in Jefferson City.

This association will take an active part in showing up the adaptability of the State for dairy purposes if it be given a chance. Considering its geographical situation, climate, soil and accessibility to market, Missouri is beyond compare the first state in the Union for dairying, and with seventy-five (75) butter and cheese factories in operation in the State, and many private dairymen who are producing as fine goods as can be found in the market, it does not seem impossible to so organize and develop the industry between now and 1893 that the State shall be creditably represented in this line.

The room there is for developing our dairy interest is indicated by the simple statement that while we have seventy-five (75) butter and cheese factories in operation, the neighboring State of Iowa has five hundred. More than one hundred were established last season. There is a growing interest in this line of agriculture, both as a source of profit and as a means of conserving the fertility of the soil.

Competition with adulterated dairy products and spurious goods is the great obstacle to successful dairying. At the annual meeting held January 15-16, 1891, a committee was appointed to submit to your honorable body a measure for the establishment of a

FOOD AND DAIRY COMMISSION.

Such a commission would be a great assistance, not alone to dairymen but to manufacturers of lard, vinegar, producers of honey, molasses and other food products. It would be in the interest of producers and consumers of food.

THE BOARD'S NEEDS.

I must here renew the earnest recommendation made in the last report, that this Department be provided with office room commensurate with the needs of the work. Space for library and documents, as well as fire-proof accommodations for valuable property of the Department, is absolutely necessary. Should your honorable body see fit to transfer the State Veterinary service from the control of the Curators of the State University to that of the Board of Agriculture, further additional room will be required.

But the great and pressing need is funds with which to carry forward vigorously the different lines of work that properly devolve upon a board of agriculture.

What use is made of the annual appropriation of three thousand (3,000) dollars to the Board of Agriculture?

Nearly one thousand (1,000) dollars of the amount is required to pay postage, express and freight charges in distributing the 14,000 copies of the annual report, a volume of 500 pages.

Five hundred (500) dollars are used in meeting the traveling expenses of the members in attending the annual and other meetings of the Board. One-half of the annual appropriation is thus exhausted before the real work is begun.

The expense connected with gathering material of value for a volume of 500 pages, contributions, illustrations, maps, and the expense incurred in trips to Jefferson City to superintend the printing, require another five hundred (500) dollars.

We now have one thousand (1,000) left with which to meet the cost of making monthly crop reports, for which alone there should be at least three thousand (3,000) dollars, meeting the ordinary office expenses, stationery, lights, fuel, janitor's fees, etc., etc., for which five hundred (500) dollars is hardly adequate; holding Farmers' institutes, for which five thousand (5,000) dollars could be expended to advantage; for maintaining a State weather service, for which one thousand (1,000) dollars is needed; clerical assistance, for which two thousand (2,000) dollars could be judiciously spent, and many other things for which there should be money. Is it strange, then, in view of the foregoing, that the Board of Agriculture is not doing all that should be done?

The Board should be able to employ an Entomologist to inform the farmers of the State regarding insect pests. It ought to be able to inquire into the establishment of new enterprises, like the manufacture of sugar from sorghum or beets, the culture and manufacture of fibrous crops, to aid in the developing of live-stock, dairy and other industries by co-operating actively with the State Dairymen's association, the Horse-breeders' association, the Bee-keepers' association and kindred organizations, which are for the purpose of advancing distinct lines of agriculture. It should take an active part in movements to bring about improved roads, by holding trials of road machinery and the dissemination of information on how to construct and repair roads. In short, the Missouri State Board of Agriculture should be so constituted and provided with sufficient funds to enable it to take advanced ground all along the line of battle for the material, social and intellectual advancement of the great agricultural class.

Will any one, who has the slightest conception of what Missouri is in area, population, resources and possibilities, say that three thousand (3,000) dollars per year is enough with which to carry on all the work the Board already has in hand?

Ten times this amount is not too much, and would be returned many fold in the increased prosperity of the farmers, and, through them, of all the people.

If the State Department of Agriculture is to be continued in existence, the Board feels warranted in asking for an annual appropriation of the following sums of money with which to carry forward the work of developing the agricultural resources of the State:

For holding Farmers' institutes	$5,000
For publishing monthly crop reports	2,500
For clerical service	1,500
For maintaining a State Weather service	1,000
For distribution of Annual report	1,000
For expenses of members attending meetings of Board	500
For office expenses	500
Total	$12,000

The recognition of the agricultural interests by the present Legislature will have the effect of assuring the farmer of the appreciation of his needs by our public men.

In an intelligent, prosperous and progressing agricultural class lies the hope of the nation and the race. Therefore, whatever is done that shall really help the farmer to keep step in civilization's march cannot be class legislation, for all mankind is helped thereby.

That the good done by the Board of Agriculture is not limited to the farmer is manifested in their efforts to bring about such perfection in agricultural methods as shall result in the maximum of production at a minimum of cost. In the accomplishment of this purpose will the producer of food and all who eat be blessed.

Respectfully submitted.

LEVI CHUBBUCK, Secretary.

AGRICULTURE RECOGNIZED

BY THE

THIRTY-SIXTH GENERAL ASSEMBLY.

The following statement, published since the adjournment of the Legislature in the Monthly Bulletin, is appended:

The State Board of Agriculture has reason to feel proud of the indorsement given its work of the past two years by the Thirty-sixth General Assembly, the session of which has just closed, and the farmers of the state to feel gratified at the recognition their most important calling received.

At the annual meeting of the Board held November 7, 1888, Professor J. W. Sanborn, who had been the Board's Secretary since 1882, declined a re-election, his duties in connection with the Agricultural college and Experiment station having become so heavy as to prevent his giving the necessary time to the work of the Board, which, through his labors, had also been developed to such an extent as to require the full time of a Secretary.

The present incumbent was elected to the office at that time, and accepted the place with the understanding that he would devote his entire time to the work of the Board.

At that time the Board was in receipt of three thousand dollars ($3,000) annually with which to carry forward its work of developing the agricultural resources of the great State of Missouri—a sum so limited, for the needs of the case, as to hardly enable the Board to do enough to even make its existence known to the farmers of the State.

It was confidently expected that the Thirty-fifth General Assembly would increase the appropriation for the Board to an amount that would enable the department to meet the demands made upon it, and it was with this expectation that the undersigned accepted the position as Secretary, fully realizing, through years of intimate personal contact with the agricultural interests of the State, the great amount of work devolving on the Board and the very pressing need of relief from agricultural depression.

THE WORK OF THE BOARD.

The Board outlined the work to be undertaken as follows:

I. To investigate the sorghum-growing industry with reference to its introduction into Missouri.

II. To inaugurate the holding of a State Fat-Stock show and a State fair.

III. To secure quarantine laws against the introduction of animal diseases from other states, the execution of which to be vested in the Board of Agriculture as the only official farmers' organization in the State.

IV. To aid the Sheep-Growers' association at their annual shearings.

V. To ask an annual appropriation of ten thousand dollars ($10,000) with which to hold fifty Farmers' Institutes, further perfect the system of making crop reports, giving liberal prizes for crops, and to carry out other lines of work.

VI. To establish a State Weather service in co-operation with the National Government.

VII. To secure the reorganization of the Board of Agriculture so as to change the term of office from a life to a time tenure.

VIII. To secure an increase of the salary of the Secretary from six hundred dollars ($600), the limit fixed, so as to warrant that official giving his whole time to the work of the Board.

With the work thus outlined the duties of the office were assumed, but the Legislature did not make the appropriation requested, only giving the three thousand dollars ($3,000) per annum previously appropriated.

However, with a desire to do what could be done under the circumstances to aid the farmers of Missouri, the task of carrying out as fully as possible the policy of the Board was undertaken.

My predecessor had inaugurated two distinct lines of work; viz., a system of monthly crop reports and holding Farmers' Institutes. Of the former about one thousand (1,000) copies were issued monthly during the growing season, the information being compiled fron returns received from one thousand correspondents throughout the State. These reports grew in favor with the public, and soon came to be regarded as authoritative.

Fifteen hundred (1,500) copies were issued monthly during the season of 1889, my first year of work, and sent to correspondents and to the press of the State. This did not get the information contained in the reports to the farmers as generally as was desired, so, during the season of 1890, the plan of issuing the report in the form of supplements to weekly newspapers was tried.

Because of inadequate funds to meet the cost of printing, the aid of the press was asked. By charging the papers using the supplements a price covering cost of printing the copies sent to each, we were able to issue five thousand (5,000) copies a month in that form. But this did not meet the demand, so to increase the circulation of the reports and to meet the cost, advertising space was provided on the sheets and advertising enough to meet the cost of printing was solicited. We increased the number of copies to ten thousand (10,000) a month, and finally to fifty thousand (50,000), that being the number of copies of the November report of last season.

As will readily be conceded, this involves a large amount of labor, but the good accomplished is well worth the effort.

For the first seven months of the year's work, the Secretary undertook to carry all the work without assistance, but in September of 1889 a part of the time of a stenographer and type-writer was secured.

A STATE WEATHER SERVICE ESTABLISHED.

In August of 1889 the Board succeeded in making arrangements with Gen A. W. Greely, Chief Signal Officer, by which a station was established in Columbia in connection with the Board of Agriculture, and a meteorologist detailed from the National service to act as assistant to the Secretary in developing a State Weather service. Thus one of the proposed lines of work advised by the board was established. The State Weather service has been of great aid to the Board and very valuable to the farmers' interests.

FARMERS' INSTITUTES.

During the winter of 1889-90 the Secretary held fifteen Farmers' Institutes scattered well over the State, involving very arduous labor on all who assisted for about one month of solid time, holding meetings during the day and passing from point to point by night trains, or often by wagon.

More than twice as many calls for meetings were received as could be held with the funds at command, and, to meet the demand as far as possible, the strictest economy in the matter of expense was exercised. The meetings were arranged so as to hold as many as possible on a given line of travel, and at the same time visit all sections of the State. Those who attended as lecturers were paid only their hotel bills and railroad fare.

The labor involved in and the difficulties attending the arranging for and holding such a series of meetings under such adverse conditions can only be appreciated by those who have been engaged in the work.

During the fall and winter of 1890-91, twenty-eight Farmers' Institutes were held—nearly twice as many as had ever before been held during one season in the State.

For a portion of this season the services of Honorable S. C. Bassett, Secretary Nebraska State Dairymen's association, were secured to lecture on dairying. He was paid five dollars per day.

We were still unable to pay home talent anything for the time devoted to efforts to instruct the farmers of the State in more profitable methods of farming.

This, briefly, was the work of the past two years: gathering and publishing crop, stock and weather statistics during the summer, holding Farmers' Institutes during the winter, keeping up the routine work of the office, keeping the records and attending to a very large correspondence, the compilation of the annual report, a volume of five hundred pages, and the distribution by mail and express of 14,000 printed copies.

In accordance with repeated action of the Board of Agriculture, on the convening of the Thirty-sixth General Assembly a bill was submitted to the House Committee on Agriculture, providing for the reorganization of the Board.

The bill was passed, has been signed by the Governor, and is now the law.

SYNOPSIS OF THE NEW LAW.

The important features of the measure are: That the Board shall consist of one member from each congressional district, with the Governor, Superintendent of Public Schools and the Dean of the Agricultural College as *ex officio* members; the term of office limited to three years. Duties of the Board as set forth are: To annually examine into the management of the Agricultural College and Experiment Station, and report to the Legislature as to its condition and needs; to assume control of the Veterinary service of the State, and appointment of the State Veterinarian; publish crop and stock reports, meteorological data and general information as to the best methods of farming in all lines; to hold Farmers' Institutes, and to make an annual report to the Legislature regarding the condition and needs of agriculture. The number of copies of the annual report is increased to 20,000, and the size of the volume to 800 pages.

APPROPRIATION ASKED AND RECEIVED.

The Board asked for an appropriation of twenty-four thousand dollars with which to meet the contingent expenses and carry forward the work for the next two years. Twenty-one thousand three hundred dollars ($21,300) was given, as follows: Ten thousand dollars ($10,000) for holding Farmers' Institutes; five thousand dollars ($5,000) for publishing monthly crop reports; two thousand dollars ($2,000) for maintaining a State Weather service; fifteen hundred dollars ($1,500) for distribution of annual report; one thousand dollars ($1,000) for the expenses of members attending meetings of the Board; six hundred dollars ($600) for office expenses; and twelve hundred dollars ($1,200) for clerical service.

STATE VETERINARY SERVICE TRANSFERRED.

The provision that the Board of Agriculture shall have control of the Veterinary service necessitated amendments in the law under which this service had hitherto been controlled by the Board of Curators of the State University. These were also passed, and this work, which is of so much importance to the stock men of the State, will hereafter be under the direction of the Board of Agriculture.

Now that a new State Board of Agriculture is to be appointed by his Excellency, Governor Francis, the foregoing brief record of what has been done in the past two years is submitted.

It should be remembered that the members have served without pay, are dependent on their own labors for a living, and have given their time and energy to the cause of agriculture. The Secretary has been paid six hundred dollars per annum, a sum less than half as much as is paid almost any ordinary clerk in any other of the State departments, although it is expected that he be a man well versed in the science and art of agriculture, able to compile reliable statistics, monthly and annual reports, hold institutes, direct a State Weather service and give information in all lines of agriculture.

WHAT MAY BE EXPECTED.

With the Board reorganized under a more effective law, a State Weather service in operation, the Veterinary service attached to the Board, and a sum of money sufficient to permit good work being done in gathering and disseminating information, the farmers of the State are justified in expecting that much good will follow.

The signs of the times point to a period close at hand of prosperous agriculture.

Farmers have suffered sorely for a series of years, but out of the suffering good is coming.

The time when the notion prevailed that "any fool could farm" has passed, the recent years of agricultural depression having proven that farming is a business that must be conducted on business principles, with the use of trained intelligence and the most efficient methods, such as in every other business, if success is to be expected, will secure the greatest results at the least cost.

To increase the profits of farming by the dissemination of information which will enable the farmer to get larger returns per acre at less cost of production, has been, and must still be, the purpose of the Board of Agriculture, for in the attaining of this end it will be doing good to all the people, those who grow farm products, and those who are consumers.

It is hoped that the farmers of Missouri will take an active interest in the work of the new Board of Agriculture, which doubtless, as has been the case in the past, will try to serve the farmers' interests. It is only through manifestations of interest that the Board will be able to determine if good is being done, and this will be the test of whether it will be worth the while to continue it in existence at State expense.

TREASURER'S REPORT

FOR THE YEAR ENDING NOVEMBER 6, 1890.

COLUMBIA, MO.

JOHN S. CLARKSON, *Treasurer, in account with State Board of Agriculture:*

Date.	On what account.	Amount.	Balance.
1889.			
Nov. 7..	To balance on settlement	$1,123 79	
20..	W. F. Mayhall, crop reports and maps	20 00	
20..	Leibhart Com. Co., list of names	5 00	
20..	P. Paquin, printing	25 00	
20..	W. F. Wright, crop reports and maps	5 00	
20..	Broderick, list of names	10 00	
25..	Exchange, Chubbuck, crop reports	16 00	
Dec. 3..	" " "	15 00	
13..	" " "	29 90	
13..	Poplar Bluff Citizen, "	1 00	
14..	Exchange, Chubbuck, "	11 50	
17..	" " "	26 00	
17..	" " "	20 00	
17..	" " "	5 00	
17..	" " "	3 00	
1890.			
Jan. 4..	State Treasurer	1,500 00	
18..	Trenton Republican, crop reports	12 00	
18..	C. E. Beets, "	9 00	
April 3..	Marion County Herald, "	6 00	
16..	C. F. Stephens, "	8 00	
16..	C. F. Clark, advertising	5 00	
19..	Anderson & Kimbrough, advertising	5 00	
May 7..	Deposit from Veterinary department	107 15	
28..	M. B. W. Harmon, advertising	10 00	
28..	A. J. Child, "	24 00	
July 11..	State Treasurer	1,500 00	
Aug. 19..	Trumbull, R. & A., advertising	6 00	
19..	A. J. Child, "	15 00	
19..	Stanberry Sentinel, crop reports	5 00	
Sept. 5..	Warrant 620 for crop reports	6 00	
15..	H. McK. Wilson, advertising	10 00	
			$4,544 34
1889.			
Nov. 19..	By J. E. Crumbaugh, rent of opera-house	50 00	
19..	M. F. Doud, expense account	27 30	
19..	J. H. Fulbright, "	44 95	
20..	Maud C. Smith, salary	25 00	
20..	S. H. Elkins, P. M., P. O. supplies	23 20	
20..	Levi Chubbuck, expense account	14 85	
22..	E. W. Stephens, printing	87 50	
23..	W. G. Barrett, "	24 50	
23..	B. O. Cowan, expense account	15 50	
23..	A. Leonard, "	8 75	

TREASURER'S REPORT—Continued.

Date.	On what account.	Amount.	Balance.
Dec. 21..	By C. A. Raum, agent, freight	$43 32	
21..	E. F. Ammerman, agent, express	56 05	
21..	Maud C. Smith, salary	25 00	
21..	L. Chubbuck, expense account	16 55	
21..	S. H. Elkins, P. M., P. O. supplies	27 50	
21..	W. G. Barrett, printing	15 10	
23..	E. F. Ammerman, agent, express	91 25	
24..	Anderson & Kimbrough, livery	17 50	
26..	L. E. Shattuck, expense account	10 20	
26..	Norwood, stove	10 55	
1890.			
Jan. 3..	E. F. Ammerman, agent, express	144 00	
4..	L. Chubbuck, expense account	300 00	
Feb. 6..	J. H. Fulbright, "	41 65	
6..	S. H. Elkins, P. M., P. O. supplies	116 70	
6..	Maud C. Smith, salary	25 00	
7..	E. W. Stephens, printing	108 25	
8..	H. Silver, making book-cases	15 00	
8..	W. G. Barrett, printing	29 50	
8..	J. L. Erwin, expense account	99 37	
11..	Dr. T. J. Turner, "	10 07	
18..	M. B. W. Harman, "	15 45	
25..	E. F. Ammerman, express	45 51	
25..	L. Chubbuck, expense account	36 55	
25..	Maud C. Smith, salary	25 00	
Mar. 7..	S. H. Elkins, P. M., P. O. supplies	42 00	
8..	W. W. Hornberger, gas fixtures	9 35	
12..	L. E. Clement, expense account	7 45	
19..	J. H. Fulbright, "	26 30	
24..	A. Leonard, "	25 00	
26..	Maud C. Smith, salary	25 00	
27..	J. L. Erwin, expense account	25 00	
Apr. 25..	S. H. Elkins, P. M., P. O. supplies	10 50	
27..	I. L. Crume, salary	50 00	
27..	L. Chubbuck, expense account	23 10	
26..	J. W. Emerson, "	12 00	
26..	M. B. W. Harman, "	20 35	
26..	J. A. Potts, "	12 80	
26..	B. O. Cowan, "	22 00	
May 2..	W. G. Barrett, printing	34 15	
24..	E. D. Porter, expense account	18 95	
24..	I. L. Crume, salary	50 00	
28..	E. F. Ammermann, agent, express	10 65	
28..	L. Chubbuck, expense account	54 35	
28..	Mary E. Murtfeldt, Entomological work	50 00	
30..	W. G. Barrett, printing	102 00	
June 5..	S. H. Elkins, P. M., P. O. supplies	37 00	
6..	E. W. Stephens, printing	7 00	
16..	L. Chubbuck, expense account	50 65	
26..	E. F. Ammerman, agent, express	47 14	
26..	Matt. Hanes, awnings	22 25	
July 8..	I. L. Crume, salary	50 00	
29..	L. Chubbuck, expense account	47 70	
Aug. 2..	I. L. Crume, salary	50 00	
5..	O'Rear & Baker, lamp, oil and twine.,	7 15	
Sept. 2..	E. F. Ammerman, agent, express	16 20	
2..	M. B. V. Page, expense account	4 80	
2..	I. L. Crume, salary	50 00	
2..	L. Chubbuck, expense account	32 95	
2..	S. H. Elkins, P. M., P. O. supplies	15 50	
2..	C. C. Newman & Co., making rain gauges	21 20	
6..	W. G. Barrett, printing	131 70	
29..	L. Chubbuck, expense account	38 60	
29..	S. H. Elkins, P. M., P. O. supplies	64 00	

TREASURER'S REPORT—Continued.

Date.	On what account.	Amount.	Balance.
Sept. 29	By E. F. Ammerman, agent, express	$12 76	
29	A. Schweich, drayage	30 83	
29	I. L. Crume, salary	50 00	
Oct. 3	Central Type Foundry, printing outfit	114 45	
4	W. G. Barrett, printing	65 25	
18	I. L. Crume, salary	50 00	
18	L. Chubbuck, expense account	14 28	
18	E. F. Ammerman, agent, express	47 74	
18	S. H. Elkins, P. M., P. O. supplies	35 00	
21	Crist & Son, making book-cases	12 40	
22	W. G. Barrett, printing	46 65	
			$3,450 83
	Balance		1,093 51
	To balance, November 6, 1890	$1,093 51	4,544 34

TWENTY-THIRD ANNUAL MEETING.

The annual business meeting of the State Board of Agriculture was held in Columbia, Mo., in the office of the Secretary, in the Experiment Station building of the Agricultural college, Wednesday, November 5, 1890.

Members present—Dr. M. M. Fisher, Acting President of the State University, and Dr. E. D. Porter, Dean of the Agricultural college, *ex officio* members; J. A. Potts, President; F. W. Smith, Vice-President; Abiel Leonard, J. H. Fulbright, B. O. Cowan, and Levi Chubbuck, Secretary.

President Potts presided.

On motion by Dr. Fisher, Robert J. Holmes, a prominent farmer from Johnson county, was invited to participate in sessions of the Board.

On motion, the minutes of the last annual meeting as printed in the annual report were indorsed and the reading dispensed with.

B. O. Cowan and Abiel Leonard were appointed a committee to settle with the Treasurer.

On motion of J. H. Fulbright, the Secretary made a brief statement of the work of the called meeting of the Board in Jefferson City, in December, 1889, and also a statement of the work done in the office in the past twelve months.

The Secretary called particular attention to the work in the office rendered possible by the establishment, by the United States Signal service, of a station in connection with the State Board of Agriculture, and suggested that the Board in some manner recognize their obligation to the Signal service in Washington.

A. L. McRae, the Observer, was invited to give a brief history of the Signal service work in its connection with the work of the Board of Agriculture.

Abiel Leonard commented favorably upon the amount of work done by the Secretary of the Board during the year, and upon the place gained for the Board in the estimation of the people of the State. Mr.

Leonard moved that the Board adopt a resolution indorsing the work of the Observer, which should be forwarded to the Chief Signal Officer in Washington.

Dr. E. D. Porter and Secretary Chubbuck were appointed a committee to draft a resolution.

Election of officers was the next order of business.

J. A. Potts was renominated for President, but demurred, suggesting that the honor of the office should be passed around, and asked to be retired from the office.

A ballot for officers resulted in the election of F. W. Smith, President, Abiel Leonard, Vice-President, and the re-election of Levi Chubbuck, Secretary, and J. S. Clarkson, Treasurer.

On motion, the Board adjourned to 1:30 p. m.

The afternoon session convened with a quorum present.

A telegram was received from His Excellency, Gov. D. R. Francis, and a letter from John R. Rippey, regretting unavoidable absence. A message from Judge John Hinton, President of the Board of Curators of the State University, brought his greeting, and stated that illness prevented his meeting with the Board.

The report of the auditing committee was received and the committee discharged.

AUDITING COMMITTEE'S REPORT.

Hon. J. A. Potts, President State Board of Agriculture:

Dear Sir—Your Committee appointed to audit the accounts of the Secretary and Treasurer find accounts all correct, and proper vouchers for all expenditures.

Amount of money on hand Nov. 7, 1889	$1,123 79
Receipts from State Treasurer	3,000 00
Receipts from all other sources	420 55
Total receipts, with balance on hand	$4,544 34
Total expenditures	3,450 83
Leaving a balance on hand	$1,093 51

Respectfully submitted.

A. Leonard,
B. O. Cowan.

The committee on resolutions reported the following, indorsing the work of the Observer of the Signal service, which was adopted and a copy ordered transmitted to the Chief Signal Officer:

Columbia, Mo., November 7, 1890.

Resolved, That the Board of Agriculture of the State of Missouri, in annual session, hereby expresses its appreciation of the valuable service rendered the interests of agriculture, in this State, by the work of its Weather service established in connection with this Board, and pledges its hearty co-operation with the U. S. Signal service in this most important branch of its work.

Resolved, that the thanks of this Board be tendered to Sergeant A. L. McRae, for the zeal and efficiency with which he has discharged the duties of his office as Observer of the Signal service.

J. A. POTTS, President,
LEVI CHUBBUCK, Secretary.

The following resolution offered by Secretary Chubbuck, indorsing Prof. F. E. Nipher of the Washington university, St. Louis, for Chief of the Weather service, was unanimously adopted:

Resolved, by the State Board of Agriculture, That the National Congress is to be commended for transferring the Weather service from the War Department to the Department of Agriculture.

Further, be it resolved, That, as it will be incumbent upon the President of the United States to appoint a Chief of the National Weather bureau when made a division of the Department of Agriculture, the Missouri State Board of Agriculture in annual session assembled do indorse and earnestly recommend to the President, Professor Francis E. Nipher, of Washington university, St. Louis, Missouri, who established and for years conducted with signal ability the Missouri State Weather service, as a man eminently qualified for the position.

The Secretary read a communication from the Committee on Agriculture of the Columbian Exhibition in Chicago.

It was the expressed sense of the Board that the Thirty-sixth General Assembly make a liberal appropriation for an agricultural exhibition in 1893.

The Board considered the advisability of having the acreage and yield per acre of the various staple crops of the farm listed by the assessors and the information furnished the Secretary of the Board, and heartily and unanimously expressed approval of such a measure, and directed the Secretary to bring the matter in proper shape before the Legislature.

The number of Farmers' Institutes and the season for holding them were left to the judgment of the Secretary.

The committee appointed to draft a bill for the reorganization of the Board submitted a draft of a measure, which was discussed, but action deferred.

On motion, the committee was not discharged but continued, but as a legislative committee. On motion, J. H. Fulbright and B. O. Cowan were added to the committee.

Voted, that the whole Board be constituted a consulting committee to meet in Mexico, Mo., during the session of the Farmers' Institute December 19-20, 1890, to further consider the measure for the reorganization of the Board.

No further business, the Board adjourned.

LEVI CHUBBUCK, Secretary.

FARMERS' INSTITUTES.

The Board of Agriculture held as many Farmers' Institutes during the past year as the limited fund under the control of the Board would allow, and they were held at points from which came the most urgent demand within a circuit which could be economically reached.

The papers read at these meetings will be found in this volume.

Only discussions which followed the papers are recorded in the succeeding pages. SECRETARY.

SULLIVAN COUNTY.

GREEN CITY, Mo., Oct. 15, 1890.

The ninth annual series of Farmers' Institutes, held by the Missouri State Board of Agriculture, was begun at Green City, Mo., on the morning of October 15, 1890.

Chas. B. Comstock, manager of the Green City creamery, through whom the invitation came to the Board to hold the Institute at that point, called the house to order and acted as chairman.

Levi Chubbuck, Secretary of the Board of Agriculture, was called upon to explain the work of the Board in general, and the purposes of this meeting. "These Farmers' Institutes," he said, "were for the purpose of getting the farmers of a county together to discuss means and methods of making farming more profitable. Men who have had wide experience as dairymen, fruit-growers, stock-feeders, and in other lines of farming, are invited to attend and give those present the results of their experience. The discussions are free to all who will take part, the purpose being to draw out and impart all the information possible."

Reference having been made to the Agricultural college and Experiment station at Columbia, the Secretary explained that the Board of Agriculture had no official connection with the institution. It was under the management of a Board of Curators which was entirely distinct from the Board of Agriculture. The college was for the instruction of young men and women who attend the institution, while the Experiment station, which is a department of the college, is intended as a means of developing new facts applicable to agriculture. The Board of Agriculture was created to gather information of value to the agriculturist from all available sources and by all possible means, and convey it to the farmers of the State in the most effective manner possible, and to do whatever could be done to advance the cause of agriculture. The warrant for the establishment and maintenance of such an institution as a board of agriculture is in the fact that agriculture is the basis of all other industries; that in the development of improved methods of farming by which an abundance of cheap food can be profitably produced, all mankind are interested.

It was remarked that the farmers of the State should get into touch with the Agricultural college and Experiment station, by sending for the reports and bulletins, which are sent free to any farmer who will request them, and by sending their boys there to pursue the course of instruction given.

AFTERNOON SESSION.

DAIRYING.

Hon. S. C. Bassett, Secretary of the Nebraska State Dairymen's association, was introduced to discuss the subject of dairying.

He said: There have been great changes in dairying in the last ten years, and the successful dairyman must recognize this and adapt his methods to them. The farmer used to trade out at the store his butter, but now it is a cash article if of the right quality. The prices of dairy products, if noted in the daily papers, are received by wire from the market centers, and are regulated by the supply and demand. Another change in dairying is in marketing the butter while fresh. Packed butter, no matter how good, will not bring the highest price. A few years ago any kind of salt was thought good enough for butter, but now butter salted with barrel salt will not bring full price. The best dairy salt must be used. It used to be thought that only tame grass and spring water would make a first-class grade of butter, but we in Nebraska have convinced the world that the wild grass of the western prairies and well water will make good butter.

You have here in Missouri all the requisite natural facilities for successful dairying. You have advantages not to be found in other so-called dairy states: you have a longer pasture season, your State is one of the great corn states, thus enabling you to grow an abundance of the best stock food, and you can provide an abundance of pure water. You can market your product in all directions.

Better prices for dairy products prevail in winter than in summer, and with your mild winter you again have the advantage over other states; but many contend that it costs too much to make butter in the winter, and as we dairy for the money there is in it, we want to do the work when it will yield the best returns. If we will examine the market reports, we will see that prices for butter range from 50 to 100 per cent higher in winter than in the spring and summer, when the market is overstocked with goods; but if it is going to cost enough more to make butter during the winter than during the summer, and thus offset the difference in prices, we are no better off. Let us see: cows that are fresh in the fall will yield from 10 to 20 per cent more milk and butter in the course of the year than will spring cows. By the time the latter come to the period where they naturally begin to fall off in milk flow, the drouth of summer is making the pastures short, water is getting scarce, flies are bad, and the almost inevitable result is that the cows shrink badly in milk flow, and once this has occurred it is next to impossible to increase the flow to any great extent. With the fall cows we can, with barns and abundance of forage, better control the conditions. No man need expect to be successful at dairying without feeding grain during the winter and in summer also—at least when there is not a full feed of grass. Tests have shown that $24 worth of grain will make in the winter time $112 worth of cream, while in summer $12 worth of grain made $75 worth of cream. Discretion must be used in feeding grain to cows during the winter, otherwise one is likely to have his cows in the spring only fit for beef. This brings up the question of what kind of a cow is the best. There are few of the right kind. She must be one that will properly assimilate and convert her food into milk. As soon as a cow begins to lay on flesh, she is worthless in the dairy.

In the corn belt, corn is the cheapest dairy food, but it can't be used exclusively. It has too large a proportion of the starchy elements, and should be fed with bran, oats, and other flesh-forming foods.

Cows must be examined as to their individual dairy qualifications. It is not always the heaviest milker that is the most valuable. There is marked difference in the amount of milk and butter different cows will make from 100 pounds of food.

Question: To engage successfully in winter dairying, do we not need a cheaper food, such as ensilage?

Answer: We need to provide as cheap food as we can. I depend largely on fodder corn cut up just as it begins to glaze, put into shocks and let stand in the field. It makes a large amount of cheap and splendid food.

Mr. Myers: It is claimed that in winter dairying one doesn't get much out of his calves.

Ans.: Fall calves do the best with me. Even spring calves do better if fed some dry food with their milk.

Ques.: Do you feed whole or skim milk to calves?

Ans.: Skim sweet milk and a regular amount.

Ques.: What is the relative cost of buildings for winter and summer dairying?

Ans.: That can only be answered in general terms. Winter dairying does not necessarily require expensive buildings; they need only be such as will shelter the cows from the storms and make them comfortable.

Mr. John Patterson, of Adair county, said that the food required to make a pound of beef, net weight, would make a pound of butter, and the difference in the market price of the two products would show the relative profit of dairying and beef-raising.

Ques.: How much help is required to run a dairy farm?

Ans.: One hand to 20 cows will do the milking, and do the farm work.

Ques.: What is the best breed?

Ans.: The breed is not so important as the individual. There are good individuals in all the breeds. Would of course take a dairy rather than a beef breed.

Ques.: How can one tell a good cow?

Ans.: One of the best marks of a good dairy cow is that she be wedge-shaped.

Mr. Patterson said that the only sure way to tell was to test each cow by weighing her milk and testing its quality.

Ques.: Will a cow that is crowded last as long as one that is not?

Ans.: No, a cow is a machine for converting hay and grain into milk and butter, and like any other machine, will wear out quickly or slowly according as it is used.

Ques.: Are the calves from dairy breeds of cows as valuable as those from beef breeds?

Ans.: Not for beef purposes.

Ques.: How shall we get cream from milk?

Ans.: In one of two ways: by setting in deep cans in cold water, or by the use of the centrifugal separator. Under the deep setting system the milk should be put into the water as soon as possible after milking. Every moment the milk is allowed to stand and cool before setting decreases the per cent of cream that will rise; 4 pounds of butter to the 100 pounds of milk ought to be obtained. Under the gathered cream system a given measure of cream does not represent a given quantity of butter; hence, a method of testing should be used. Separated cream has much less chance to absorb deleterious odors than has raised cream. Odors that cream and butter may have absorbed may not be noticed by those who are in constant contact with them, but will be readily detected by the public when the products are put on the market.

Mr. Chas. B. Comstock, manager of the Green City creamery, presented a paper setting forth some of the advantages of the creamery over the ordinary farm dairy, and the financial benefit a creamery was to a community.

Inquiry being made regarding

ENSILAGE,

Mr. Bassett said there was no mystery about it; it is simply green fodder preserved, much as fruits are kept by canning. The silo in which the ensilage is made and kept is a bin or vault, either wholly or partly above or below the surface of the ground, according as it is most convenient; it must be as nearly air-tight as practicable. The ground is a good enough floor if surface water is kept out. If the silo is above the surface, the walls must be made strong to resist the pressure, which is considerable. Corn is the crop most generally used in making ensilage, but any green crop can be used. Some put the fodder into the silo whole; but for convenience in handling, it is much better to cut into at least inch pieces. Corn should be put into the silo soon after the grain has passed out of the milk. The crop should be grown as though for a crop of grain. The ensilage is preserved by fermenting and becoming heated to 120°, which expels the air. We used to tramp the ensilage down with horses as it was put into the silo, and heavily weight, but this has been found unnecessary. We only need to see that the ensilage is spread evenly as it is run into the silo, and possibly tramped a little about the edges. It is not even necessary to cover with anything but the ensilage itself. The first six inches will mold and spoil; but this layer forms a perfect cover, and is as cheap as anything. Ensilage makes excellent food, and much more can be made per acre than by any other means. Three tons of ensilage is regarded equal in feeding value to one ton of timothy hay. From five to seven times as much food in corn ensilage can be obtained from an acre as from an acre of hay. There is not so much waste in ensilage as in stacked hay or shocked corn. One cubit foot of ensilage in the silo is a ration for a cow, so it is easy to estimate the feeding capacity of a silo. In feeding, take from the top of the silo, never from the bottom.

NIGHT SESSION.

ANIMAL DISEASES.

Dr. T. J. Turner, deputy State Veterinarian, read a paper on Tuberculosis or Consumption, which will be found elsewhere in this volume.

Ques.: Do you include "lumpy jaw" with tuberculosis?

Ans.: There are two kinds of lumps that appear on the jaws of cattle: one form is known as big jaw or actinomycosis, in which the lumps form on the bone. It is distinct from tuberculosis. In the other form the lumps are tumor-like, and are in the flesh. Such cases are known as "lumpy jaw," and are phases of tuberculosis or consumption. Animals affected either way should be removed from the remainder of the herd.

Ques.: In dissecting a supposed case of tuberculosis, where will the germs be found?

Ans.: The germs can only be found by the aid of a powerful microscope, but the lesions will be found in the lungs, liver, spleen and other parts.

Ques.: Is not the supposed existence of tuberculosis among our cattle made an excuse by Europeans for keeping our cattle out of their markets?

Ans.: Yes; but they have more of the disease among their cattle than we have among ours, and what we have was brought originally from Europe.

Ques.: Is there such a thing as kidney worm?

Ans.: There are many things which may cause a breaking down in the loins: a stroke on the back, inflammation, fatty degeneration, paralysis, etc., etc.

Ques.: May it not be due to want of exercise?

Ans.: That would not be an especial cause of weakness in that part, but would cause a general debility resulting in that part being easily affected.

Ques.: Can consumption arise without the germs getting into the system?

Ans.: No; diarrhea is often the first symptom of the active disease. It is more often found among high-bred animals than among scrubs.

HORTICULTURE.

J. W. Clark, Professor of Horticulture in the State Agricultural College, was called on to discuss fruit-growing. Being asked to name a list of the best apples to plant, he said: Select such varieties as bear well, look well, and sell well. As a rule, kinds that do well in the East are not good in the West. Ben Davis, Wine Sap, Jonathan, Smith's Cider and Rome Beauty are all good, but may not all do well in a particular locality. We must plant such as are adapted to our soil and location.

Ques.: Tell us how to grow an orchard.

Ans.: Take any good corn land, prepare it as for a crop of corn; get good two-year-old trees from the nearest home nursery; plant 25 or 30 feet apart; cultivate the land in corn or some hoed crop if the land is rich, until the trees come into bearing; then let the orchard occupy the ground alone, but continue the cultivation of the land as long as apples are wanted. Set either in the spring or fall. If in the fall, must see to it in the spring that the hole in the soil by the trunk, caused by the wind swaying the tree, is not allowed to remain.

Ques.: How can the insects troublesome to the apple be overcome?

Ans.: The round-headed borer can be kept from the trees by placing a cylinder of wire netting around the base of each tree. The damage done by the larvæ of the codling moth can be lessened by spraying the trees just after the blossoms fall, with a solution of Paris green, one pound of the green to two hundred gallons of water. A second, and if heavy rains come, a third spraying should be given before the weight of the apple bends the blossom end downward. No spraying should be done before the blossoms fall, for fear of poisoning bees and honey. If too strong a solution of Paris green is used, it will kill the foliage.

Ques.: When is the time to prune trees?

Ans.: If to make a tree grow, prune while it is dormant. Pruning when the tree is growing will check growth.

When setting out trees, cut back the top to balance the roots.

Adjourned.

GRUNDY COUNTY.

TRENTON, MO., Oct. 16, 1890.

Judge Geo. H. Hubbell, as chairman of the Grundy county Institute called the house to order for the opening session. He apologized for the comparatively light attendance, saying that many of the farmers of the county didn't understand what were the purposes of the meeting. He commended this method of instructing farmers, recognizing that there was great need for instruction.

HORTICULTURE.

Prof. J. W. Clark was called on to discuss fruit-raising. He asked that those present indicate what fruits they would like to have discussed.

Ques.: Can we grow plums successfully?

Ans.: Yes. The Wild Goose class do the best because of their thick skin, which enables them to resist the curculio. Damsons and other European kinds are worked on seriously by the curculios. They can be successfully fought by spraying with Paris green solution.

Ques.: Will it not pay to spray to prevent wormy apples?

Ans.: Most certainly. A test of spraying at the Missouri Agricultural Experiment station showed that on trees not sprayed, three-fourths of the apples were wormy; while on trees standing near that were sprayed, there were but few wormy ones.

Ques.: What is the best method of spraying?

Ans.: If in the fruit business, one should prepare for the work thoroughly. Get a good force pump and fit it to a barrel. Attach to the pump a good nozzle which will make a fine spray, and a few feet of rubber hose. A wagon may be used from which to do the spraying. Care must be taken to get good Paris green. Much of that on the market is not effective. There are two broods of the worms in a season, unless the first brood are all killed. All the fruit-raisers of a community should co-operate in fighting the insect, for one neglected orchard will be a breeding ground from which the moths will spread throughout the community.

Ques.: Is the Kiefer pear a good kind?

Ans.: Yes, especially for canning purposes. It is not of the best flavor, but is passable, and is a good and early bearer.

Ques.: Is the apricot successfully grown?

Ans.: Not in Missouri. It blooms too early.

Ques.: Can't we mulch and keep the trees back?

Ans.: No.

Ques.: What kind of apples shall we plant for a commercial orchard?

Ans.: If Jonathan does well, plant it; but beyond that, stick pretty close to the Ben Davis. Willow Twig, Smith's Cider and Winesap are good.

Ques.: Is the Jeniton good?

Ans.: It is a good apple to eat, but is not a profitable apple to grow.

Ques.: How about the Duchess pear?

Ans.: It must be grown as a dwarf, but is one of the best pears grown.

Ques.: What is the best slope for an orchard?

Ans.: Any slope where the soil is good.

Ques.: When should pruning be done?

Ans.: Get the tree into shape while it is young.

Ques.: How about whole and piece root-grafts?

Ans.: There is no material difference.

Ques.: Is the Downing Ever-bearing mulberry good?

Ans.: I don't think any of the mulberries are profitable to grow for market.

DAIRYING.

Mr. S. C. Bassett, of Nebraska, opened the discussion of dairying, by saying that it ought not to be necessary to discuss the importance of the dairy industry; but there are many who do not realize to what magnitude it has been developed, until they look the matter up. We in Nebraska found that it was third in importance among the agricultural industries. $10,000,000 were found to be invested in the business, when $1,000,000 would have been considered a large estimate. Wisconsin has become a great State through the development of the dairy industry. Not many years ago it was thought in the East that good butter could not be produced in the West; but we are making butter in Nebraska and selling on the track at Elgin prices.

The question might be asked, is Missouri a good dairy state? We know Wisconsin is, for this has been proven, but we don't know about Missouri. You have healthy cows, an abundance of cheap food and a favorable climate. All you need in addition is the dairymen. You have men in the State who are making a first-class article, as I have learned since being here. In Green City I was shown a certificate of award of second premium, taken by Mr. Comstock at the St. Louis fair, on butter shown in competition with other states; while Mr. Adams of the Chillicothe (Mo.) creamery took the sweepstakes at the great dairy show held at Chicago a few years ago.

The right kind of dairymen will have the right kind of cows. A cow that has suckled a calf through a season is not as good as she otherwise would have been. A good dairy cow must be properly bred. A draft horse is as good for trotting as a beef-bred cow is for dairy purposes. Better not attempt to dairy with anything but dairy breeds.

Profitable dairying means the feeding of grain. Shelter from storms must be provided, and to allow the regulation of the food. Steers can be allowed to stand by grain after they get used to it, but not so with cows. Their food must be limited to what they will eat and convert into milk and butter. If allowed to gain in flesh, the milk flow will fall off.

Ques.: How about silos?

Ans.: I think well of them, but think barns or some sort of comfortable shelter for the cows should first be provided.

Ques.: Do you breed your cows so they will come in at a certain time?

Ans.: That brings up the subject of winter dairying. [See report of Sullivan Co. meeting.—Sec'y.] Nebraska farmers are not making, on an average, more than 200 pounds of butter per cow, per year. They ought to average 300 pounds.

Ques.: In raising cream by the deep-setting method, how cold should the water be?

Ans.: The colder the better; 40° if possible.

Ques.: Must the cans be entirely under water?

Ans.: No.

MORNING SESSION.

Mr. Chas. B. Comstock's statement concerning the Green City creamery was read, after which Judge P. H. Yakey, manager of the Trenton creamery, presented a statement showing the amount of milk and butter handled. He said one difficulty they had to contend with during the winter was insufficient quantity of milk.

Mr. Spencer, a patron of the creamery, stated that dairying was a source of profit to him. He milked eighteen or twenty cows, and the income for milk for one year was $520. He did not claim that he had the best cows; thought they could be greatly improved. He fed the skim milk to calves and they have done quite well.

Mr. Bassett said he was a strong advocate of the creamery system of dairying. It relieved the household of a great deal of drudgery. As good or even better butter can be made on the farm, but the conditions necessary for a good article are harder to control there than in the creamery, and the chances are that the butter will be off grade. The value to a community is not usually fully appreciated. Through it the boys on the farm can be given employment, and not interfere with their going to school. The objection held by many to dairying is the loss of revenue from the calves, but a good dairy cow will give more value in milk than the calf is worth. Dairying yields a constant revenue, and with ready money one can buy cheaper than on credit. He thought the outlook was favorable for good prices. Comfortable shelter must be provided, and a good supply of a variety of foods. Clover hay, if well made, is good for cows—better than timothy. Fodder corn is good. Oats are a perfect grain food.

Ques.: Is ensilage butter of a good quality?

Ans.: Much of it is of the Elgin standard.

Mr. Pack, of Trenton, stated that a few years ago he was at work in an office with no thought of dairying. But failing in health, he left the city, and, with everything to learn about dairying, he undertook the business. Many farmers complain that they make no money, but it is because they follow too closely in the old ruts. If manufacturers do so they soon have to go out of business. Speaking of the Jerseys he said that while it is not claimed that they are a beef breed, much Jersey beef is being used. It would not pay to raise for the market, but for home consumption it was the best that could be raised. The Jersey is, however, distinctively a dairy breed. The cows require less food for a given quantity of butter than other breeds. Jersey milk and butter have a peculiar flavor that gives them value. The milk is more easily digested than is that from other cows.

POULTRY CULTURE.

Mr. G. W. Fry, of Dunlap Mo., read a paper on poultry raising, which will be found elswhere in this volume.

Mr. Bassett commended poultry raising as an adjunct to dairying. It requires but little capital, and the income is about all clear gain.

A gentleman said his wife sold $90 worth of poultry, which did not cost over $5 to raise.

AFTERNOON SESSION.

A paper by Judge J. C. Schnelle, of Sullivan county, setting forth the tendency of farmers trying to handle too much land and stock, was read and discussed.

Hon. J. W. Donovan, of Livingston county, said it was true that the average farmer tries to do too much. A small farm well handled will yield more income than a large one half cultivated. It cost no more food to raise a good animal than a poor one. A poor animal was dear at any price.

A gentleman lately from Arkansas, where he had been handling a herd of dairy stock which had won over $300 worth of premiums at the St. Louis fair, said this showed what could be done in a field regarded as unpromising. As stated in the paper, we must not try to do too much. Such meetings as this are of great value in leading farmers into methods of farming. At a Wisconsin Farmers' Institute, a man said he came to one of the meetings with his cows making him but $12 a head per year. He got ideas then, which enabled him to make them yield him $58 a head.

Another man present said the points in the paper were of vital importance. He had learned in Ohio how to farm profitably on land naturally thin. When he came here he found the farmers running their land down. He began clearing land and is trying to maintain its fertility. He keeps sheep which, while they have been profitable in themselves, have helped to keep up the land. He rotates his crops. Has found that wheat on a small scale paid, although most farmers do not think it pays. It leaves the land in good condition for seeding to grass, and if seeded, only the wheat seed is lost if the crop is a failure. His most frequent mistake in farming is in trying to handle too much.

TUBERCULOSIS

Was discussed by Dr. T. J. Turner.

Ques.: What are the visible symptoms of the disease?

Ans.: It may show itself in tumors, formed on the sub-maxillary glands on the lower jaws, or you may notice distressed breathing. Only an expert can diagnose accurately. A scofulous animal may live a long time and breed, but would advise that such a one be destroyed.

Ques.: Should the meat from a diseased animal be cooked or fed raw to hogs?

Ans.: If fed at all, cook it thoroughly, but better not feed it.

Adjourned.

DAVIESS COUNTY.

GALLATIN, Mo., Oct. 18, 1891.

Hon. W. H. Hickman, Daviess county's representative in the Legislature, presided as chairman. The paper by Judge Schnelle, being read, was discussed.

D. L. Kost argued that the cause of lack of profit in farming is due in large part to overreaching. He urged that all present take an active part in the meeting, as a means of getting information of value to them as farmers.

Mr. John Cover related some of his experience as a farmer. By manuring his meadows, particularly the poor spots, and by running his mower cutter-bar high so as to leave a good stubble as a protection to the grass roots, he had succeeded in raising three tons of timothy to the acre. He recommended a manure spreader as a most valuable tool. Farmers should make and use all the manure they can. Any man can set stakes for his neighbors to sight by if he will. We have the soil and conditions for successful farming.

HORTICULTURE

Prof. J. W. Clark said, in discussing fruit-growing, that for market one should only grow a few kinds of apples. An apple tree is a machine for manufacturing fruit from the food given it to eat. To be successful as a fruit grower, one must give the orchard care, and become a specialist. Don't try to get more than a crop of apples from the orchard land in a season, otherwise you will exhaust the soil fertility and get nothing. Don't let tree heads get too open. Apples will pay as well as any crop we can grow if well cared for.

Pear trees are so subject to blight that it is questionable if they are profitable. No variety is blight-proof, but some are less subject to the disease than others. The Seckel and Kiefer are as free from it as any.

Ques.: Agents are selling apple trees in this section for forty cents each, claiming that they are grafted on whole roots. Are they better than when grafted on piece roots?

Ans.: So-called whole-root grafts are not on whole roots, and if so, are no better than piece-root grafts. See that you get good roots, and you need not ask if whole or piece-root grafts.

Ques.: Would it be well to mulch apple-trees with sawdust?

Ans.: Don't use sawdust, for it may contain eggs of insects which will be injurious. Straw free of weed seeds may do good. The best mulch, however, is a layer of loose surface soil. The surface soil of an orchard should be kept loose and free of weeds. It does not take much time if done at the right time.

Ques.: Is the Yellow Transparent a good apple?

Ans.: Yes, for family use. It is one of the earliest. For market one must grow the fruit called for.

Ques.: How high should an apple-tree head be started?

Ans.: From 3½ to 4 feet. Do your pruning while the trees are young. Plant one and two-year-old trees, not older. Plant in the fall preferably. Prune severely only when the tree is dormant.

Ques.: Which are best, budded or grafted trees?

Ans.: But little difference. Look at the tree and not the manner of grafting.

Ques.: What are the best cherries for us?

Ans.: Early Richmond and Late Duke. If curculios are troublesome, they can be fought with Paris green. Spray four times during the season. A weaker solution—one pound of the green to 300 gallons of water—must be used than for spraying apple-trees. A few trees can be protected by keeping chickens under them.

ANIMAL DISEASES.

Dr. Turner presented a paper on tuberculosis, which was followed by a discussion of animal diseases.

Mr. S. C. Bassett, of Nebraska, related his experience in inoculating with attenuated virus as a means of preventing hog cholera. The method was the one practiced by Dr. Billings. He had lost many hogs by cholera until he began to inoculate. The effect of the inoculation was to give the hogs the disease in a mild form, after which they seem to be safe from attack. The virus is introduced into the system by means of a hypodermic syringe

The business of inoculating hogs has not been successful, for it is only a preventive measure and not a cure, and must be applied while the hogs are free of disease. Few farmers seem willing to go to the expense of inoculating well hogs. Care must be taken to prevent the inoculated hogs coming in contact with others for about thirty days after treatment, as they will give the disease in a virulent form. A hog dying with cholera has but little blood. This is one of the surest marks of the disease. If cholera appears in a herd of hogs, he would remove the well ones to a high, dry, clean location, but leave the sick ones where they were.

Dr. G. T. Netherton, V. S. of Daviess county, discussed the subject at some length. He said that since the isolation of the disease germ, it had been easier to determine what to do. He thought the time was close at hand when the disease could be controlled.

NODAWAY COUNTY.

MARYVILLE, Mo., Oct. 20, 1890.

Col. M. B. W. Harman, member of the Board of Agriculture, Pickering, Mo., called the meeting to order, and requested that ex-Governor A. P. Morehouse act as chairman. On taking the chair the Governor expressed regret at the small attendance of farmers. He said there was no better way of getting information of value to them as farmers, than by attending such meetings. The Legislature has provided the means for holding these meetings, so that farmers can get together to discuss ways and means of making farming more profitable. It is discouraging to the State Board and to the gentlemen who come here to assist in making the meeting profitable, not to see a house full. It is a most mistaken idea that a man with a blind mule is a farmer. No man needs more education than the farmer.

Perhaps in this fertile and fruitful county of Nodaway, farmers do not so much feel the need of getting information as to profitable ways of farming as they do in other sections.

Secretary Chubbuck being called on, took occasion to explain that the Board of Agriculture had nothing to do with the management of the Agricultural college of the State, and that these meetings were not held by the college as some supposed, or in its interests. Members of the College Faculty, as well as others who have had wide experience in different lines of agriculture, are asked by the Board to attend these meetings for the purpose of giving the farmers, present the benefit of their experience. As the chairman intimated, the meetings are simply for the purpose of getting farmers and those interested in farming together to discuss such subjects as will develop information which will make farm life more pleasant and profitable.

HORTICULTURE.

Prof. J. W. Clark, of the Missouri Agricultural college, was called upon to discuss fruit culture. He said:

Mr. Chairman, Ladies and Gentlemen:

I suppose I am to discuss the subject of Horticulture, and will say at the outset that I have no cut and dried speech.

I simply get up here to talk on anything in the line of fruits, and if you will give me something to start on I will say what I can; if I can give any information I shall be pleased to do so. If I had a speech ready prepared it might not be adapted to this meeting.

Ques.: What are the best varieties to raise in this section for market?

Ans.: This year apples are in good demand and sell for good prices. In setting a commercial orchard, only a few varieties should be planted, and these should be the most productive and best market varieties which will do well in your section.

The first question to ask when selecting fruit for commercial purposes is, does it bear well? The second, does it look well? If it is of fine flavor all the better. But unless a variety is productive and attractive it can never become a profitable market fruit. No matter how good an apple may be, if it does not look well, not one in a hundred will buy it. Very few people know one apple from another, except it be simply by difference in color, and judge an apple by its looks.

The apple that brings the most money to the grower is the Ben Davis; it bears well, looks well and sells well. Not because it is a good flavored apple, for there are many others of better flavor, but because it looks well. There is another apple which is much better than the Ben Davis; it is the Jonathan. It is of fine flavor and does well in a strong and rich soil.

There will always be a market for the Jonathan, because it is a good eating apple, and it will be hard to overstock the market with them. Willow Twig is a good apple, so is the Winesap if grown on rich ground.

If you want a fall apple, the Fall Pippin is a good one. The Maiden Blush is another profitable market apple. Better set out very few early apples unless you know where you can dispose of them. For a winter apple the Ben Davis, Jonathan, Winesap, Missouri Pippin and the Willow Twig are good. We could extend the list, but the nearer you stick to these the better.

In regard to caring for an apple orchard, in a few words I would say: Fit your soil the same as for corn or wheat; plant your trees twenty or thirty feet apart according to soil or growth of the variety, then head them back one-half or two-thirds the length of the branches to balance the roots destroyed in taking up the tree; cultivate the trees from the year you set them out till you cut them down. An apple tree is a machine, or simply manufactures apples from material taken from the earth and air, and you have no more right to expect a tree to produce fruit year after year without feeding it, than you have to expect any other machine to manufacture its products without the raw material being supplied; orchards to be profitable must be fed and cultivated.

The farmer or fruit-grower of to-day, to be successful must understand something of the habits and the nature of the diseases, and the insects preying on his trees and fruits. One of the greatest hindrances to growing apples profitably is the codling moth, which causes the wormy fruit. At the College when we came to pick the apples, 75 per cent of the fruit was wormy.

Four trees standing to one side of the orchard were taken as an illustration. Two of these trees were sprayed twice, the other two were not sprayed. Those sprayed gave 75 out of every 100 apples free from worms, while the other two gave 75 out of 100 wormy. From this we see the difference between spraying and not spraying. The cost of spraying was only about 10 cents to the tree and these trees averaged six bushels each, so that the difference in price of the wormy and the good fruit was many times greater than the cost of spraying.

A man to succeed must realize that he cannot neglect his trees; they must be cared for the same as any other crop.

Ques.: Is the Janet a good apple to plant?

Ans.: The Janet is an apple which many seem to think they must plant, but it is unprofitable to grow. I know a dealer in this State whose principal business is buying apples, and he says: "I wish there was not a Janet in the State of Missouri; it cracks, is small and is not in demand as a market apple. It may do to plant for home use, but as a market apple it is not a desirable one." I do not think there is another fruit capable of being grown in this State, if your soil is adapted to it, that can be made as profitable as the apple. As for over-stocking the market with choice fruit well handled, there is no such thing as doing it. You have the best market in the world for apples.

Just at the North of you a little way into Iowa they cannot raise apples profitably; south of this State the climate is too warm for apples; when you go west into Kansas you soon strike that section subject to hot winds where apples do not thrive, so you have open to you the markets of the South, West and Northwest

Those who compete with you will have to ship their apples a greater distance and pay the extra charges before they can compete with you in these markets.

You have this market and you always will have it. If I had land suitable for apples near a good shipping point I would set it to apple trees at once, and should intend to see to them. I should not set them out and then let them take care of themselves as many do. I think this year there is many a farmer counting upon the money received from apples to pay off the mortgage on his farm.

One man in Leavenworth sold his apple crop for $30,000, while men in different parts of this State have received from $10,000 to $12,000 for theirs, so you see apples are bringing their owners a great many dollars this year at least. But every year will not be like this one, and every farmer should not go to raising apples because this year they are bringing good prices.

You can grow a bushel of apples cheaper than you can grow a bushel of corn, and you sell your corn for 25 or 30 cents per bushel, which is considered a good price for corn, but a poor price for apples. If you have good honest winter apples you can get more than 30 cents any time.

Ques.: How were apples last year? What were the prices?

Ans.: Twenty and thirty cents. Now I will show you right away, as you will see in the State Board report of last year, how apples were then.

I sent nine barrels to St. Louis to P. M. Keily & Co., to sell on commission. I wanted to prove the difference between apples handled with care, and those not properly handled. Six barrels of these apples I put up myself; of three of these I made two grades, two barrels of No. 1, and one of No. 2. The other three barrels made only one grade. The remaining three I had a dealer put up for me, and I labeled each three barrels so that the receivers could tell one from the other, and told them to examine each lot carefully and sell them on their merits.

There were three bushels to the barrel. The three barrels I sorted and made two grades of brought $6.30, or $2.10 a barrel. The three barrels not sorted, all going as one grade, sold for $5.40 or $1.80 per barrel. The three barrels the dealer put up brought $4.20, or $1.40 each.

This shows the difference between handling apples properly, and sending them to market poorly sorted, bruised and loosely packed.

Fruit-growing is more a specialty than general farming.

It is, as a rule, better to set apples on high ground because the late frosts are more liable to injure the crop on low ground, for this reason: cold air is heavier than warm air and will flow down the sides of a hill like water, the warm air rising above the cold.

I believe I said in the first of these remarks that I would plow an orchard and cultivate it every year from the time it is first planted until cut down.

Miss Annie Wolfers, of Pickering, Mo., read a paper on "Success is the Fruit of Industry," which was well received and called forth a vote of thanks to the writer.

Mrs. S. C. Powell, of Maryville, read an admirable paper on "Agriculture and Education."

MORNING SESSION.

J. W. Harman of Barnard, Mo., presented a paper on "Dehorning."

B. O. Cowan, member of the Board of Agriculture, New Point, Mo., spoke of the Shorthorn cattle. Mr. Cowan is one of the most successful cattle breeders of the State. His herd of cattle was shown at all the leading state fairs last fall, and, in competition with best herds of all the breeds, won first honors.

Ira Moore, of Maryville, Mo., discussed the "Percheron Horse." His remarks were as follows:

The Percheron-Norman is an improved variety of the old Norman war-horse, used by knights in early days, and is a native of La Perche, France. They stand from 15 to 16 hands high, and are almost always gray. They are heavily built with heavy fore shoulders, and powerful hind quarters. They have remarkably large joints, sound, big bony legs, and excellent feet. They are claimed to be a cross between the Arabian and the old Norman draft-horse.

The department of La Perche has long been celebrated for superior horses. Its experts in breeding would naturally seek to get the activity of the Arabian and retain the strength of the Norman. This could be effected by crossing a particular type of the Arabian stallion with Norman mares. It has been estimated by those engaged in the business that several hundred Percheron-Norman horses have been imported into the United States in the last two years. As this breed possesses most of the qualities of strength and activity, and the form to use these gifts to a better advantage than any other breed, it follows as the effect of that cause, that in a few years we shall be in the possession of a very superior class of horses.

In regard to the origin of the Norman war-horse from which the Percheron sprung, there is nothing positively known. They have existed in France for centuries, and have a fixed type that must have been bred in the family for many generations, because it stamps its impress so faithfully upon their offspring. The Normans have formed the basis of every draft-horse that has existed in Europe or Africa since the origin of the breed.

Brilliant (1899) (756) was imported to the United States in the summer of 1881, by M. W. Dunham, of Wayne Ill., and since has been at the head of Oaklawn stud, where he has earned a distinction as being the leader of the stud of draft-horses that has won the first prize at the only two great shows in America that included all breeds.

Never before have the colts of any draft stallion sold for so great prices—a large number at the age of three and four having been sold at from $3,000 to $5,000, and the average of his weanlings for the present year reaches $1,125.

AFTERNOON SESSION.

Judge Ira K. Alderman, Secretary Standard Poland-China Record association, Maryville, Mo., read a paper on swine industry, which will be found elswhere in this volume.

Dr. H. B. Adair, deputy State Veterinarian, presented the paper on Tuberculosis, written by Dr. T. J. Turner.

Hon. S. C. Bassett, secretary Nebraska State Dairymen's association, followed with a lecture on dairying.

J. Y. Sawyer, of Chicago, explained methods of handling milk, and operated a DeLaval hand separator, showing the superiority of removing the cream by machinery as soon as milked, over the old way of setting and allowing the cream to rise slowly. More cream is obtained by the machine method than by any system of setting; better butter is made because of less exposure to deleterious conditions, much expense for cans, jars, and for setting the milk, is saved, and the skim milk is available for feeding purposes while yet warm and fresh.

T. W. Gaunt, of Maryville, Mo., one of the veteran nurserymen and horticulturists of the State, presented a valuable paper on fruit-growing. It is printed elswhere in this volume.

F. J. Grigsby, of Maryville, Mo., discussed the merits of the trotting horse in a paper presented in the body of the report.

NIGHT SESSION.

A well-written paper on Education and Agriculture, by L. A. Martin, School Commissioner of Livingston county, Mo., was read by I. L. Crume, Assistant Secretary Board of Agriculture.

Col. M. B. W. Harman presented the following:

Resolved, by the farmers of Nodaway county, that Farmers' Institutes held for purposes of discussing various topics of interest to farmers are a valuable means of developing and disseminating information, whereby the best means and methods can be utilized in making farming profitable.

2. That we thank the U. S. Agricultural department for its success in stamping out pleuro-pneumonia, and its efforts to secure inspection of our meats and animals designed for export, and our food and products consumed at home; also its efforts to secure a home-grown supply of sugar, and prevent undue speculation in farm products.

3. That we commend the liberal appropriations made by our present Congress to connect the waters of the lakes with our great interior rivers, improve those rivers, and open deep harbors on the Gulf, which we believe will not only relieve our cattle industry of many of its depressing causes, but by opening up means of exchange along the lines of latitude, will give our western farmers choice of markets that railroad competition cannot control, and will transfer the busy center of civilization from the Mediterranean basin to the Gulf of Mexico.

4. That we thank our present Congress for its efforts to give us more money per capita, and hope they will continue to give us a currency in which gold and silver and their representative in paper shall be equal in value, elastic in character, and say $30 per capita, or of sufficient amount to perfect our exchanges without interfering with the great laws of supply and demand.

5. That we heartily indorse the Inter-state Commerce law, and hope that it will be so improved as to prevent railroads and other corporations from levying taxes at will upon western farm products, and discriminating in favor of certain points, thus enabling speculators to unduly control prices.

6. That we respectfully ask our incoming Legislature to so amend the law creating a State Board of Agriculture as to make it consist of a President, Vice-President and Secretary from the State at large, and a Vice-President from each congressional district, with a time service, and give said Board control of all our agricultural interests, including our Agricultural college and Experiment station, and give said Board sufficient aid to fully equip the Agricultural college and station, and farm, for the purposes for which they were designed; also to perfect the farm crop, weather, annual report and institute systems of the Board.

7. We respectfully ask that our State University, Agricultural College, Normal, School of Mines, State Board of Agriculture, State Horticultural Society and other means of higher education be endowed with an amount of money by the State to at once make them the peers of any similar institutions on earth, and worthy of the grand great State of Missouri.

8. That the improved bredes of live stock are absolutely necessary to profitable and successful farming in our county and State, and that we cannot successfully compete with either Texas or the states of the Ohio and Missouri valleys without them.

9. Experience of both the past and present, of both America and Europe, of both theory and practice, confirms the assertion that successful farming must be based upon a sensible rotation of crops, either for successful stock, grain, or fruit-growing, and the more prominent red clover is made a factor in the rotation, the greater the success will be.

10. That our industries should be diversified to the very utmost extent possible, and while we welcome every industrious moral citizen, we should make special efforts to induce manufacturers, educators, improved live stock, dairymen and fruit-growers to cast their lot with us, and help develop our natural resources and supply our large and growing home demands.

11. That a permanent pasture is a myth, a snare and delusion. While forty or more true grasses and possibly ten of the clovers can be successfully grown in our country, only the timothy and red clover are profitable, and they should generally be raised together, and always as a part of a rotation of crops.

12. That the conditions of our soil and climate require a short stiff-straw, smooth amber colored wheat, sown upon a deeply plowed, well-pulverized clover sod, about the middle of September, and that Red May has more of the qualifications and fewer faults than any variety yet tested.

13. That $500 each per annum should be appropriated and expended under the auspices of the State Board of Agriculture, to promote the interests of the State Horse, Shorthorn and Wool Growers' associations of the State.

14. That $1,000 should be appropriated by the State to defray the necessary expense of holding the American Agricultural Congress, which meets in Missouri next year, and as much more to defray the necessary traveling expenses of delegates appointed by the Governor to attend this and other industrial inter-state conventions, where it is deemed necessary or expedient to have Missouri represented.

15. That a majority of the qualified voters of each school district should have absolute power to control and use for public purposes, their school-houses.

16. That the thanks of this meeting are tendered to our county papers for the splendid manner in which they have advertised and reported the proceedings of this meeting; also to the Mayor and city council, public officers and citizens of Maryville generally for their cordial reception, and especially to the members of the State Board of Agriculture and their accompanying visitors, for the rare treat they have given us.

M. B. W. HARMAN,
J. W. DEAN,
IRA MOORE,
T. W. GAUNT.

The same committee reported the following resolutions eulogistic of Jas. B. Prather, which were unanimously adopted:

WHEREAS, We learn with regret of the indisposition of Hon. James B. Prather; and

WHEREAS, His enthusiastic life-long efforts in behalf of the improved live stock interests of Northwest Missouri entitle him to our gratitude, and to be enrolled amongst our public benefactors; therefore, be it

Resolved, by the farmers of Nodaway county in institute assembled, That we cordially tender him our hearty sympathy in his affliction, and hail with delight the prospect of his speedy recovery, and sincerely hope that he may soon regain his health and again take his place amongst the foremost in promoting our live-stock interests, and that a committee be appointed by the chair to present Mr. Prather with a copy of these resolutions.

Hon. L. E. Wolfe, State Superintendent of Public Schools, addressed the audience. He expressed the interest he felt in the meeting. The idea of a meeting, the purpose of which was to advance an industry, was to him full of thought. Progress was a wonderful thing. His heart was full, to think that the boys were marching on, on, aye, up. What is civilization? It is what we see about us: the farmer making food and clothing out of inert matter, mechanics applying the laws of cohesion, etc., the minister teaching of life after death, the judge meting out justice to all, the inventor developing an implement which helps to make life's labor lighter, the artist who preserves the faces of dead heroes. Civilization is a march forward. He is an optimist, and has no use for the man who does not think the world is going on and will go on and on. Edison is what he is because he has clasped hands with the great of the past. The savage who first plied the rude oar to the water laid the foundation for the proud ocean steamer of to-day. The savage in Central Africa who took ore and rudely separated the good from the bad, took the first step toward what is being done now in mining; and so on all along the line. We must grasp hands with the past and with each other. Knowledge is power, and so farmers from all parts of the country should be here to get what is being disseminat.ed

Many of the forces of nature have already been harnessed and are being made to serve the wants of the race. When we see what has been done, shall we doubt that knowledge is power? 'Twas a glorious time when Watts stood on the green and thought, and thought out the steam engine. He needs no monument to keep his memory green. For four thousand years the weaver sat by the loom, and threw forward and backward the shuttle and wove a thread at a time; now by the use of machinery, devised by the brain of man, his power is multiplied a thousand times. More knowledge is required to make proper use of the forces now under man's control than was formerly necessary. Only a trained mind can use to advantage modern farm implements and machinery.

Knowledge is power, not only to the leaders, but to the masses; hence, I firmly believe in free schools. It pays to educate the masses.

We can't afford not to. Ancient nations each gave to the world something of value, but it remained for America to give to the world the free school. The world cannot show greater munificence than this gift by America of free education to the masses. Through this gift, America will solve the problem of a free ballot to the human race.

Some say our nation will go down to ruin, and as proof refer to the accounts of corruption and crime that fill the papers, and sigh for the good old times. We know more of what is going on in the world, because we read more.

Gov. A. P. Morehouse and others followed with remarks complimenting the speaker on his address, and expressing their pleasure in having been present at the meeting. A cordial invitation was extended to the Board of Agriculture to hold another meeting in Nodaway county at an early date.

Adjourned.

DEKALB COUNTY.

MAYSVILLE, Mo., Oct. 22, 1890.

Mr. Russell, President of the DeKalb county F. & L. Union, called the house to order and acted as chairman.

Secretary Chubbuck was requested to speak of the Board of Agriculture and its work.

DAIRYING.

S. C. Bassett, of Nebraska, was next called upon to discuss dairying. He said the adaptability of the West to dairying was no longer questioned, nor is it a question as to the profitableness of the business. Good healthy cows bred for dairy purposes, comfortable shelter, plenty of cheap food, abundance of good water, are the requisites for successful dairying. As to transportation, you can, through dairying, compress the bulky products of the farm into a small compass, and get them to market in the form of butter cheaper than in any other way, and by means of refrigerator cars, you can lay your dairy products down in the eastern markets, about as cheap as can the eastern dairymen, who have to depend on the express companies for transporting their goods.

Dairy cows have to be handled and fed with more care than any other kind of stock. Dairy products must be handled with the greatest care and neatness from the time the milking is done until the product is put on the market. Prices for butter are usually from 50 to 100 per cent higher in winter than in summer. A cow dropping her calf in the fall will give more milk in the course of the year, than when calving in the spring. Winter dairying is, therefore, more profitable than summer, particularly in this latitude, when winters are short, and mild, and it is difficult to get ice.

Ques.: Should grain be fed whole or ground?

Ans.: It is simply a question of which is cheaper.

Ques.: What is the relative value of corn meal and corn and cob meal?

Ans.: I have got the best results by feeding cob and corn ground together.

Ques.: What is the best dairy breed?

Ans.: All are good. The best for any man is the one he likes best. If you like the Jerseys, that is the breed for you. If you admire a large breed and like the Holstein, that is the breed for you to handle.

Ques.: Should dairymen raise their calves?

Ans.: In the best dairy districts they do not raise their calves.

HANDLING MILK.

In cold or deep can setting, there are certain principles that must be observed, or great loss will follow. All or nearly all of the cream must be gotten out of the milk to make it profitable. As soon as possible after milking, get the milk set and cooled down to 40° or 50°. If the milk has become cooled before the cream has risen, it should be warmed up to 60°, and then cooled quickly.

Mr. Dyer said in his neighborhood all the milk was put into ice tanks, but the cream varied in amount of butter to the gauge of cream. This was due, he thought, to the difference in the quality of the food.

J. Y. Sawyer said, milk set under identical conditions will not vary in the amount of butter to the gauge of cream, but under different manipulations, the quantity of butter to the gauge of cream will vary.

Mr. Dyer said he had increased the amount of butter to the quantity of cream one-fourth.

Mr. Bassett said, while cream varies, milk varies still more. Many cows give milk of which it takes 50 pounds to make a pound of butter, while from others 10 to 15 pounds of milk will make a pound of butter.

Mr. Brown asked if milk so deficient in butter fat would make good cheese, and as much of it as rich milk.

Mr. Bassett answered that he had no experience in making cheese, but said it was generally agreed that the value of milk depended on the per cent of butter-fat it contained.

Mr. Sawyer asked if milk set under good conditions would give as good results as the separator system.

Ans.: I cannot answer from experience. We have very few separators in Nebraska.

Mr. Sawyer said the Gurley Bros. of Illinois who operate a number of factories, using both systems, report one-fourth more butter from milk separated by the machine than from that set under the best systems. As to the quality of separator butter, the market reports would speak sufficiently. On the Elgin board of trade, the great butter market of the country, separator butter is the standard.

ANIMAL DISEASES.

Dr. Jno. Meyers, Deputy State Veterinarian, of St. Joseph, Mo., presented a paper on lameness of animals, which will be found in another part of this volume.

Ques.: What is a good healing application?

Ans.: Carbolized vaseline is good. For flesh wounds, keep them clean and apply something softening and healing like vaseline.

Gentleman: I lost two horses from getting splinters in the foot. What was the cause of death?

Ans.: Lock-jaw. The foot being a horny substance, there is no chance for the swelliing of the inflamed parts. The disease is usually fatal.

Ques.: Will lock-jaw result when there is no wound visible.

Ans.: Yes, inflammation of the bowels and other causes may lead to it. It is a nervous disease.

HORTICULTURE.

A paper on Fruit-growing, by T. W. Gaunt, of Nodaway county, was read by the Secretary and discussed at considerable length.

NIGHT SESSION.

Mrs. S. G. Loring, of Maysville, read a paper on "How to Improve the Farm Home."

J. Y. Sawyer, of Chicago, discussed the subject of separating milk by machinery, and illustrated the method by going through the operation of separating, using a hand DeLaval separator, furnished by D. H. Roe & Co.

Adjourned.

CAMERON INSTITUTE.

CAMERON, Mo., Oct. 23, 1890.

The meeting was called to order by Mr. Benjamin, who presided.

After a few remarks by the Secretary, in explanation of the status and work of the Board of Agriculture,

Dr. H. B. Adair, Deputy State Veterinarian, of Kansas City, was introduced. He read a paper on "Actinomycosis" or Big-jaw in cattle. The doctor was asked to distinguish between this disease and tuberculosis or consumption in cattle as manifested in lumps on the jaws. He said, the swellings in a case of big-jaw were bony growths on the jawbones, while in lumpy-jaw the swellings are not on the bone. The latter is the more dangerous disease.

Ques.: Is there any way of telling a big jaw bunch from an ordinary wound?

Ans.: A case of big-jaw can be detected by the peculiar fetid odor.

Mr. Sanders spoke of a lump on one of his steers, which from the description he thought must be a tubercle tumor.

The doctor advised cutting it open and putting in a piece of cotton saturated with a strong solution of corrosive sublimate.

Ques.: Is there any cure for ring-bone?

Ans.: Strictly speaking, no; but by causing the joint to grow together there will be no lameness, which is due to pain while the ring-bone is forming.

Ques.: Will a horse have a ring-bone on only one leg?

Ans.: Yes, when by being lame in one foot, the weight is thrown on the other, it will sometimes cause a ring-bone to form.

Ques.: Is there any way to cure a colt of wheezing after having had distemper?

Ans.: No, it is due to the thickening of parts of the throat. Tracheotomy will palliate, but not cure the difficulty.

Ques.: What is the cause of heaves in horses?

Ans.: In a case of heaves, there has been a breaking down of some of the lung cells, making one large cell out of two or more small ones. It is caused by eating dusty hay, and can never be cured, but is relieved by feeding soft food, grass, etc.

Ques.: What is the cause of cribbing?

Ans.: It is a vice due to idleness. It is not due to indigestion, but is the cause of the latter.

DAIRYING.

S. C. Bassett took up the subject of dairying. He showed first the adaptability of Missouri to the industry, and then outlined the requirements necessary for success. These are, briefly, good cows bred for the purpose, handled properly so as to be comfortable and well fed, the milk handled carefully from the time of milking until the butter is put on the market.

J. Y. Sawyer followed with a discussion of the importance of feeding abundanty with food of the right quality. A careful study of the food question by the dairymen will lead the way to a reduction in cost of production. The construction of the DeLaval hand cream separator on exhibition was explained, and the method of separating shown by running some milk through the machine.

Ques.: Can you, by feeding rich food, materially increase the per cent of butter-fat in milk?

Ans.: Can increase the quality some, but the character of the food will affect the quantity more.

Ques.: Why is it that milk in the fall will make 25 per cent more butter than in the spring?

Ans.: There are a number of causes. In the fall the conditions for raising cream are much better than in spring and summer, and as a result a larger per cent of the butter-fat is secured. Another important factor is the length of time from calving. The per cent of butter-fat in milk increases as length of time from calving increases, and as the large proportion of cows are fresh in spring, the natural result is that fall milk is richer than that obtained in the spring.

At the night session, Hon. L. E. Wolfe, State Superintendent of Schools, delivered an address.

Capt. Corn, of Cameron, introduced the speaker, who complimented the Board of Agriculture on the work it was doing. It was, he said, in line with his work. They were efforts to solve the problem of civilization by endeavoring to provide for the material and mental needs of mankind. He spoke particularly of the need of unifying the school work, and linking together the schools of the State. The need of having libraries in the public schools was strongly urged.

CLINTON COUNTY.

LATHROP, MO., Oct. 24, 1890.

AFTERNOON SESSION.

After remarks by Secretary Chubbuck in explanation of the Board of Agriculture and its work,

Hon. S. C. Bassett was called upon to open the dairy discussion. Much the same line of thought was followed as at other meetings of the series. Answering the question, what is the best dairy breed? the speaker said, the dairyman's likes and dislikes went a long way in determining what was the best breed for him. All of the dairy breeds are good.

Mr. Reed, of Lathrop, remarked that success at dairying depended as much on the breed of dairy men as on the dairy cows.

Ques.: What is the best grass for dairy purposes?

Ans.: Clover is the best single grass. It makes the best hay for cows. Blue-grass is good, but it is apt to fail when most needed. Clover should be cut when one-half of the heads have become brown.

It is essential that dairy cows be provided with plenty of good pure water. Open ponds that are allowed to become foul, and the water stagnant, may be the source of disease, communicated to man through the medium of the cows' milk.

Ques.: Should cows be dried off for a season before calving?

Ans.: Yes, if possible, for a month or two. It is sometimes hard to dry up a dairy-bred cow. In dairying, much depends on how the cows are fed. A cow is simply a machine for converting food into milk, and the essential difference between cows and breeds is in the capacity for doing this work. A beef-bred cow will lay on flesh if fed abundantly, rather than give an increased amount of milk. A dairy cow must not be fed beyond her capacity to convert food into milk.

Mr. J. Y. Sawyer explained the mechanism and showed the working of a hand DeLaval cream separator.

During the night session, a paper by Prof. L. A. Martin, of Chillicothe, Mo, on "Agricultural Education," found elsewhere in this volume, was read.

Mrs. A. E. McKee, of Lathrop, Mo., presented a paper of "Suggestions."

Mr. J. Y. Sawyer discussed feeding dairy cattle.

CARROLL COUNTY.

TINA, MO., Oct. 27, 1890.

The first session of the Tina meeting was begun at 2 p. m., with a goodly number of farmers present. Dairying being the subject of most interest, Mr. Bassett was called upon to lead in the discussion. After speaking of the growing interest in dairying, the important requisites for success, and the advantages Missouri had as a dairy state, asking and answering questions was the order.

Ques.: Do you think skim milk, after all the butter has been taken out, is of any value as calf food?

Ans.: Certainly, we can supply fat with that which is worth much less on the market than is the butter fat, but which is practically just as good for the calf. A calf should be fed often and in small quantities, especially while young. The milk must be warm. If it has become cold, warm by setting in a kettle of hot water.

Ques.: How should milk be handled to secure best results with the gathered-cream system?

Ans.: The first essential under this or any other system is cleanliness. Must avoid all bad odors, for milk is a ready absorbent. The milk must be set at once after milking, and cooled down as quickly as possible to 40°. The cream should be kept sweet until delivered to the factory.

Ques.: Which is better for the dairyman, to sell the cream sweet or sour?

Ans.: By Mr. Sawyer: A more even sample of sweet than of sour cream can be taken.

Mr. Sawyer thought a man engaged in dairying should make a business of it, and keep cows simply for the milk product. He would not advise a radical change from other lines of farming, for dairying is a business one can't jump into.

The butter-fat is what we want in the milk, and this is the varying constituent, and a cow's value is largely dependent on the per cent of butter-fat her milk contains. There are individuals in all breeds that give rich milk, but breeds vary greatly as to the per cent of butter-fat of the milk, and size of butter globules. We can increase the per cent of butter-fat some by feed, but not much. Excitement of the cow, especially just before milking, materially decreases the per cent of butter-fat.

The cost of milk is very dependent on the food; one ration may make the cost four times what another one would. The difference in the capacity of different cows to convert food into milk may make the cost from one, four times what it will be from another.

If one has no ice or cold water, it is best to set milk in shallow pans and keep at a temperature of about 60°, and let stand until the milk is slightly sour before skimming.

President McCune, of Avalon college, presented a paper on "Agricultural Education," which will be found in this volume.

LINN COUNTY.

MEADVILLE, Mo., Oct. 28, 1890.

One of the most interesting meetings of the series was the one held at Meadville.

Mr. J. M. Smith, Secretary Missouri State Dairymen's Association, called the house to order.

Mr. Ralph Smith, of Laclede, was chosen chairman.

Mr. S. C. Bassett discussed the dairy subject at considerable length.

Ques.: What is the best dairy breed?

Ans.: It is hard to say. One should select the breed he likes best.

Ques.: Is it safe to follow one's likes and dislikes?

Ans.: This may not be a perfect guide, but it will help materially.

Ques.: Should cows be salted daily?

Ans.: We do by keeping rock salt before them.

Ques.: Would you cross the Holstein and Jersey breeds?

Ans.: No.

Mr. J. Y. Sawyer continued the discussion. Dairymen, he said, were after the butter-fat in milk. The first thing to do, of course, is to get the fat into the milk in proper quantity, by having the right kind of cows, feeding, watering, sheltering and handling properly; but having got the fat, then the next question is how to get it out. The old way was to set in shallow pans. Much good butter was made under that system, but there is also an immense amount of poor, commonly known as "shoe-box" butter, which is a drug on the market and is what keeps the price down and makes it possible to sell oleomargarine. An improvement on this method is the setting of the milk in deep cans immediately after milking, and immersing in cold water. With this system one must have an abundance of cold water or water and ice; otherwise not enough of the cream will be raised.

The most perfect method of separating the butter-fat from the milk yet devised, is that by which centrifugal force is used. The speaker then explained the mechanism of the cream separator, one of which was on exhibition, and showed how it was operated.

NIGHT SESSION.

Rev. Mr. Butler, of Meadville, read a paper on "The Farm Home," which was well received.

Chairman Smith commented on the paper, and spoke of a man and wife who, starting in life on an equal plane, but the man, having more opportunities for social contact and improvement, soon surpassed the wife, and it was not long before friends noticed the difference and asked how the man could have married one so inferior to him. He at first despised his wife, but on second thought saw how she had been sacrificing herself for him. This was too often the case with farmers' wives. He urged that the hours for work be shorter on the farm, so that there would be more time for the cultivation of the social and mental character. Farmers need brain capacity as much as any class, and the time is coming when they must march upward or go down.

Ques.: How many hours should a farmer work?

Ans.: No more than any other man.

Mr. Butler said, one great fault with farmers was, that they lacked system in their work.

LINN COUNTY INSTITUTE NO. 2.

BUCKLIN, Mo., Oct. 29, 1890.

The farmers and dairymen of Bucklin were so urgent for a meeting that an extra one was arranged for by wire at that point. Although the notice was short, a large audience had assembled for the afternoon session, which, because of the necessity of the speakers taking an early train in order to reach the next place of meeting in time, was the only one held.

There being a cheese factory in successful operation here, dairying was the subject of most interest.

Mr. S. C. Bassett occupied most of the time in discussing means and methods of making the business profitable. Speaking of associated dairying, he said, that the nearer to the full capacity of the plant it is run, the greater will be the profit. But no matter how well the factory may be run, the profit to the dairyman is dependent on how he manages. Missouri is a great grass state. The speaker doubted if Missourians appreciated fully their advantage in this respect over dairymen in other states. Grass is the foundation of all stock food. Missouri is also one of the great corn-growing states, and this is one of the cheapest stock foods that can be grown. I notice too that you raise a large amount of wheat. The shipstuff and bran from this are splendid foods for cows; mixed with corn they make a perfect ration; none of this mill-feed should be shipped from the State. A grain ration can be fed with profit during the summer to help out the pastures, especially during dry times. If a cow is allowed to lack for food after her first flush of milk, the flow will shrink and it will be impossible to bring her back to a full flow. Fodder corn is also a valuable aid to the summer pastures.

After enumerating other advantages Missouri possessed as a dairy state, the speaker said that after all more depended on the man than on anything else.

Dairying had advantages over other lines of farming, in that it condensed the bulky farm products into a small compass. The butter product of six car-loads of hay fed to cows will weigh from one to one and one-half tons.

More skill is required to feed a cow for milk and butter, than to feed a beef animal. We call a cow a machine for converting hay, grain and grass into milk and butter. As with every machine, it takes a certain amount of food (fuel) to run the machine, and profit must be got from what is given beyond that amount.

Ques. (by Mr. Sanderson): Is it possible to carry summer butter over in cold storage and put on the market in the winter?

Ans.: We used to eat packed butter in preference to that newly made, but now the market calls for fresh goods. A dairyman should not engage in speculating.

Ques.: Will it pay to cut or cook food for cows?

Ans.: It is doubtful if it will pay to cook. As to cutting, it will depend on the value of the food. We want to save an animal that is being fattened or a cow that is giving milk as much labor as possible.

As to the relative cost of producing beef and butter, it was stated that experiments at the New York Experiment station had shown that it took no more food for the pound of butter than for the same weight of flesh.

The value of the dairy product will depend largely on the care given. Milk and butter absorb odors quickly, and it is because of this property that much of that put on the market is so poor in quality.

Ques.: Is it better for a farmer who has ten or fifteen cows to engage in private dairying, or to patronize and encourage a factory?

Ans.: It will depend much on conditions. If one has plenty of help on the farm and in the house it will pay to run a private dairy, but usually the women have enough to do without adding the dairy work. With a family of boys, dairying is a good business to give them something to do nights and mornings, without interfering with their going to school.

Ques.: What is the best can for setting milk?

Ans.: We started with the Fairlamb, but found it expensive and hard to handle. Are now using the common shot-gun can, which is cheaper and gives as good results.

Ques.: In submerging milk, will not the animal odor of the milk be taken up by the water and then be re-absorbed by the milk?

Ans.: That brings up a disputed point. I don't think there is anything in healthy milk that we want to get rid of.

CHARITON COUNTY.

SALISBURY, Mo., Oct. 30, 1890.

W. R. Slaughter, President Salisbury Butter and Cheese Co., called the meeting to order, and presided.

J. Y. Sawyer was the first speaker. He explained the mechanism of the cream separator and how it performed its work. Cream being lighter than milk, it naturally rises to the surface under the influence of the force of gravity. There being, however, so little difference in the weight of the milk and cream particles, the separation is slow; but by causing the milk to pass into the bowl of the separator, the milk and bowl whirled very rapidly, 6,000 times a minute; the centrifugal force developed causes the heavy and light particles to quickly separate. The separator takes out of the milk a larger per cent of the butter-fat than can be secured by any other method. The milk is separated as soon as taken from the cow, so there is much less danger of injury from contamination with bad odors. The skim milk is much better for feeding to calves while yet warm and fresh than it is after allowing it to get cold and sour.

Our effort should be to get the largest amount of the butter-fat out of the milk, but we must first see to it that the milk contains a large per cent of fat. This will depend, first on the individual cow, second on the breed, third on the food, fourth on the care.

Mr. Slaughter made a statement as to the business done by the Salisbury butter and cheese factory.

Mr. Bassett said that from the statement it did not appear that the enterprise had been a very profitable one, but all have to pay for experience—some more than they need to. He spoke of the importance of dairying in the West, and went on to show that we can make as good an article here as anywhere; that we have advantages of food, climate, transportation facilities and markets which should enable us to sucessfully compete with the East in this line of farming. What we need is the dairymen of experience.

NIGHT SESSION.

A communication by Mr. Schnelle, of Sullivan Co., was read. The writer pointed out some of the faults in our system of farming. One of the most common mistakes was in trying to do too much; cultivate more land than could be properly attended.

Mr. Sawyer illustrated the point by referring to a former President, who was a good lawyer, but was unequal to the demands of the presidency.

A. L. McRae, Meteorologist of the Board of Agriculture, discussed the State Weather service, and the manner of constructing lightning rods.

Adjourned.

KNOX COUNTY.

EDINA, Mo., December 16, 1890.

Meeting called to order by R. F. Schofield. Mr. McKee was chosen permanent Chairman.

Secretary Chubbuck explained the object of the meeting, and urged upon the farmers the necessity of adopting better methods.

H. J. Waters, of the Agricultural Experiment station, delivered an address on "Stock-feeding." Mr. Waters confined himself to practical methods, and gave as illustrations only results of actual experiments made at different experiment stations. His lecture was illustrated by a number of charts showing the comparative amount of gain a given amount of food will produce on animals at different ages. Mr. Waters advocates liberal feeding, scarce feeding is not profitable.

Ques.: Is it profitable to mature animals early?

Ans.: Yes.

The chief value of the silo, in Mr. Waters' opinion, is in getting the animals to eat more of corn fodder than when dry. The claims of increased value of ensilage have not been sustained.

Ques.: In feeding green, as compared with dry fodder, is there so much waste?

Ans.: Not so much, but there is loss of space and time in having to handle so much water. On the College farm we cut three rows of corn into a silo and three rows cut and dried, keeping account of labor for each. Fed ensilage to one lot of cows and dry fodder to another, and when balancing accounts found very little difference in results.

Ques.: Is the machine which husks corn and cuts fodder into short lengths a success?

Ans. (By Mr. Dod): It is.

DRAFT HORSE.

The very excellent paper read by T. Butterworth, editor Western Agriculturist, Quincy, Ill., excited a lively discussion and brought out a great diversity of opinion as to the utility of the draft horse on the farm.

A. G. Dod considers the draft horse valuable in the city for heavy loads, but considers him too slow for the farm.

Ques.: Will it do to mix draft breeds and to breed in line?

Ans. (Butterworth): Best to breed in line if possible, but by breeding on American mares the American draft horse will be produced.

Mr. Cotty sustained Mr. Dod that the draft horse is not good for much of farm work; that in extreme hot weather he does not do well on farm. He advocates the coach horse, but knows little of him, as there are few in the State and the price high. The American-bred trotter comes nearest being a coach horse. I am a friend of the draft horse, but believe in any well-bred horse and would encourage breeding any good horse. The small-bred horse stands heat better, but the heavy hauling in cities will keep up the demand for heavy horses. We can't expect all the good qualities of a horse in one breed, and must have different horses for different purposes.

In the discussion on stable floors best adapted for horses, the opinion prevailed that hard concrete floors caused stiffness in shoulders; that dirt floors were the best for the horse, but too hard to keep in condition; that wood made the most practical floor.

DAIRYING.

An able paper on the above subject, by John Patterson of Kirksville, brought about the following discussion:

Ques.: What is the milk breed?

Patterson: I have concluded that the Jerseys will make most butter from feed.

Ques.: What is your opinion of the Red Polled Angus?

Ans.: My neighbors have them, and they seem as good or better than Shorthorn, but I am not favorable to the all-purpose cow. If I want milk, I want milk.

Ques.: What about disposition of Jerseys?

Ans.: The cows are docile, while the bulls are a little like Bengal tigers.

Ques.: Don't you think the Jerseys are tender?

Ans.: I never tried them in this respect. Don't think we need to. I want to shelter my cows, so does any other man who goes into dairying. A barn will pay for itself three times each year—first, in shelter of feed; second, in shelter of stock; and third, in manure saved.

Ques.: Do you think a man would be justified in borrowing money at eight per cent to build a barn?

Ans.: Yes. In successful dairying the rotation of crops is almost the most important idea. It is a part of this system of farming and very essential. We can keep up our farms by this means.

Ques.: Is it too late to sow clover with wheat?

Ans.: No; I have good luck; I have never tried to seed alone.

Ques.: Do you find any injury done to wheat by sowing with timothy?

Ans.: I have heard of such a thing, but have had no experience.

Mr. Waters: I was raised in a wheat-growing district; have had considerable experience and observation, and never heard before of injury to wheat from sowing timothy with it.

MILK TEST.

Professor C. P. Fox, Chemist of the Agricultural Experiment station of the Agricultural college, read a paper on "Milk Testing," following with an exhibit of the practical workings of a Babcock milk tester. Milk from cows fresh last spring, the per cent of butter fat was 3¾; from one fresh in February, 4 per cent, and one in September, 4 per cent; cream from hotel 4½ per cent.

NIGHT SESSION.

Dr. H. B. Adair, Deputy State Veterinarian, from Kansas City, presented a paper on "Big-jaw," replete with practical suggestions and information. An able and exhaustive paper on "Tuberculosis," prepared by Dr. T. J. Turner, of Mexico, was also presented by Dr. Adair.

A paper on "Farmers' Need of Education," prepared by the President of Avalon college, was read by T. Butterworth.

The whole audience took a lively interest in the discussion called out by the paper, and Mr. Neale expressed the opinion that a farmer should have a knowledge of botany and entomology which will familiarize him with the life and habits of plants and insects. He should have also a knowledge of comparative anatomy and hygiene.

Mathematics is also valuable as a discipline of the mind. Book-keeping is essential for the practical benefit.

Mr. Lyon said: I am not engaged in farming, but I think farmers, as a class, would be better off financially, be happier and more contented if they had more knowledge, not alone of their business but of a general character. He should have good general ideas of architecture, horticulture and the various divisions of agriculture. All of these have certain underlying principles which should be mastered before he can pursue them intelligently. There should be some agricultural theories interwoven in the instruction of the public schools.

The Agricultural College has been criticised, and unjustly too. I remember when a student in the State University, Dr. Laws used to encourage the boys to take the agricultural course, urging that the need of this State was improved homes.

Mr. Chubbuck: Seventy-five per cent of the students of the University go from the farm homes; that means that the farm homes are sending their best boys to fill other positions, and if the farmers are holding their own, I don't see how?

Mr. Patterson: If I were a young man I should prefer to be a farmer than to be a legislator even. (Laughter.)

Mr. Dod: The question under discussion is, "What the farmer should know." I think the question should be, "What he should not know." His business is so diversified that he needs information in almost everything.

HORTICULTURE.

A paper on this subject, prepared by T. W. Gaunt, was read by H. J. Waters. In the discussion which followed, Missouri was designated the "Apple Orchard of the World," the whole area being adapted to apple-growing. The fruit crop of Missouri has in the past ten years increased ten-fold. Missouri apples are of the finest quality, and have ever secured first prize wherever they have been exhibited.

Fruit-growing was characterized the most profitable line of agriculture, but to insure this, a locality must grow a sufficient quantity to make a market.

Mr. Dod gave the experience of his brother in Jackson county, near Lee's Summit, who had been offered $125 per acre for his orchard of forty acres, but this year he sold his pear crop for $12,000, more than the land was worth.

Ques.: Is spraying to prevent codling moth practicable?

Ans.: Yes.

The spraying should be done as soon as the blossom is shed, but before the apple is heavy enough to bend the stem. Most horticulturists recommend London purple or Paris green, one pound to 200 gallons of water for apples, and one pound to 300 gallons of water for peaches. If stronger, it may burn the foliage.

Wire gauze is the best protection against borers. A close cover is likely to make the trees too tender. Have the bottom of the wire set one-half inch below the surface of the ground, and leave a little space next the trunk of the tree. It is a question whether it is necessary to close the wire at the top. I doubt the insect going to the top and working over.

Onions and garlic planted next the trees were recommended to keep out borers.

Mr. McKee: I apply a solution of asafetida in spring and fall. This keeps out borers and rabbits. The only objection to this is that it must be attended to regularly, and the danger of neglect, while in case of using wire gauze it is done for a number of years.

Mr. Patterson: If any one contemplates planting an orchard, it would be well to determine the best variety for this section. I think the Ben Davis the best.

The sentiment of the speakers was favorable to deep rather than shallow setting.

POULTRY RAISING.

A paper on this subject, prepared by G. W. Fry of Dunlap, Mo., was read. Prof. Fox suggested that keeping poultry clean would prove a protection against cholera.

In the discussion of tillage, Senator Rouner objected to deep plowing, having tried it once and raised no crop for four years. Messrs. Dod and Patterson favored shallow tillage.

H. J. Waters referred to experiments on the College farm in corn culture, when they got as much out of untilled plats as out of those tilled. In plowing, much depends on the soil and season. In dry season deep plowing does best, as a rule, but in thin soil shallow plowing is necessary.

We need the scientific data to enable us to devise a more perfect system of tillage.

Senator Rouner: I think the papers presented to-night, if properly considered, will do us much good. Practical experience in farming is of great value; no fixed system will apply each year. A general knowledge of the principles is valuable, however.

The point made by a speaker that every farmer's son should take a course in the Agricultural College is impracticable, but if a greater number would take a course and settle in different parts of the State, the influence of their example would be very beneficial.

MARION COUNTY.

PALMYRA, December 18, 1890.

E. D. Kemble called the meeting to order, and expressed pleasure at securing a Farmers' institute in their city.

J. A. Potts, President of the Board of Agriculture, was invited to preside and responded gracefully to the welcome extended, expressing gratification in being able to hold a meeting in Palmyra.

S. C. Eastman read a good paper on "Short-horn Cattle."

H. J. Waters' paper on "Stock Feeding" put him under a fire of questions for half an hour.

Ques.: What is the difference in ripe and unripe animals?

Ans.: It depends on meat or amount and fatness.

Ques.: Do horns have any effect on fattening?

Ans.: Would prefer to have them off, if for no other reason than economy of space in feeding.

Ques.: Will it pay to grind old dry corn for hogs?

Ans.: No, nor to cook either.

Ques.: How about grinding cob for all stock.

Ans.: Good, if ground fine.

Ques.: Do you think corn alone is as good as mixed stuff for hogs?

Ans.: No, except for short period for fattening.

Ques.: Will it pay to grind food for breeding stock?

Ans.: Can't say exactly, but think it safe to say that as a rule it will not pay to grind food.

Ques.: Will it pay to mix ground food with roughness?

Ans.: Think not; better feed separately.

SADDLE HORSE.

President Potts read a very excellent paper on the "Saddle Horse," which was received with applause.

Dr. T. J. Turner, Deputy State Veterinarian, expressed a willingness to answer questions.

Ques.: Can Black-leg be prevented by keeping animals less fat?

Ans.: Fat is not the cause of Black-leg, but it occurs oftener in fat animals; it is due to a germ.

Ques.: Does sudden change of food have much to do with the outbreak?

Ans.: No.

Ques.: Does locality have anything to do with it?

Ans.: Yes; it is a good plan to change locality.

Illustration by a farmer: I had a bunch of calves affected, put them into a dry lot and the disease stopped, but they got out onto the grass one night and I lost one.

Dr. Turner: The progress of the disease may be stopped by vaccination. If you find a case early, probably the best thing to do is to bleed.

Ques. What are the symptoms?

Ans. First notice the animal is very lame, and on rubbing hand over quarter you will notice a cracking sound; open the affected portion and you will find that decomposition has set in.

Mr. ———: I have a neighbor who claims that he can cure actinomycosis if he gets there before the knot united with the bone.

Dr. Turner: He can't do it. Simply because he sloughs the knot by surgical operation or arsenic is no proof that it is cured, as tumors will at the same time be in other parts of the system.

Ques. What is your remedy for thoroughpin?

Ans. None; all efforts so far are futile. You may blister with iodide of mercury, 20 grains of mercury to one ounce of vaseline; keep well oiled after having been on thirty-six hours.

Ques. Do you ever give calomel and raw linseed oil to horses?

Ans. I use calomel some, but never give linseed oil with success; simply get a lax condition of bowels. Barbadoes aloes is the best purgative. Amount depends on the condition of the animal and the disease. If constipated, with colicky symptoms, give large dose, say 1 or 1½ ounces.

Ques. How long time is needed for action?

Ans. Twenty-four hours.

Ques. Would you wait twenty-four hours for action in case of serious colic?

Ans. I should have to; but in the mean time I would give something to remove the pain and wait for purgative to remove the cause.

Ques.: Do you give morphine as a sedative?

Ans.: Yes, for spasmodic colic, one-half grain by hypodermic injection; this is quicker.

Ques.: What do you do in case of colic?

Ans.: Ordinarily use belladonna, ginger and opium; when there is an accumulation of gas I use chloroform.

Ques.: Is it not necessary to administer alkali to correct the fermentation?

Ans.: Yes, but I get better results with chloroform.

Ques.: Can blood warts be removed? The case I have in mind, the wart is large as an egg, and on pastern joint.

Ans.: Use arsenious acid. This will slough it off, but be careful in its use, as it is very poisonous.

Ques.: Explain difference between thoroughpin and blood spavin.

Ans.: Blood spavin is distention of blood vessels, and appears but on one side of the joint, while thoroughpin appears on both sides.

Ques.: Does either necessarily make the joint stiff?

Ans.: It certainly does, but not necessarily make it lame. It will likely be transmitted by heredity.

Ques.. Would you breed a mare affected in this way?

Ans.: If so, I should want to breed to a much stronger-bred horse than was the breeding of the mare.

Ques.: What causes bone spavin?

Ans.: Heredity, straining or bruises.

Ques.: If caused by accident, how do you treat?

Ans.: Two ways. By feather firing, and another method is known as point firing.

DAIRYING.

Mr. Patterson answered some questions called out by his paper.

Professor Fox gave a practical exhibition of the milk tester, and talked at some length about the machine.

Two good papers on "Sheep" were read by T. W. Clark and D. N. Proctor. Mr. Clark puts his sheep in yard every night. He thinks Marion county has as good a flock of Shropshire sheep as will be found west of the Mississippi river. Mr. Proctor advocates cross-breeding because they are hardier.

Secretary Chubbuck thanked the Marion county farmers for the good attendance and the evident appreciation of the work of the Board of Agriculture.

Mr. Haskins expressed regret that all persons who had been put on the program were not present. Mr. Kemble expressed his pleasure in the meeting, and wished that many more of Marion county farmers had been present. He expressed a conviction that the time would come when farmers will be glad to take advantage of education in their line of work which the Institutes offer.

Adjourned.

RALLS COUNTY.

CENTRE, December 17, 1890.

The morning session of the Centre meeting was enlivened by the orchestra.

G. W. Waters presided.

Secretary Chubbuck explained the purpose of the Board of Agriculture.

A. S. Smith, of Hannibal, read a fine paper on "Corn culture."

The chairman suggested that those who think they know all about corn culture tell it now.

Mr. Glascock said he favored shallow culture, but thought more depends on the season, as he could see no difference in the results obtained by shallow or deep plowing. Think deep plowing when land is in good condition is foolish. Think in dry time must plow deep to bring up the moisture. I think it impossible for a man to follow a theory as an iron-clad rule.

Mr. Boyd: I have been an advocate of deep plowing; have had a pride in keeping corn clean, and have plowed too much and too deep, and cut off all support. Think on prairie land should not plow over four inches deep. The trouble is, we do not know all the facts; a perfect theory will work out in practice.

AFTERNOON SESSION.

Mr. Glascock moved a vote of thanks to the ladies of Centre and Ralls county for the excellent dinner served.

A. S. Smith read a paper on "Agricultural Statistics."

Mr. Boyd remarked on the general excellence of the paper, and considered the statement concerning farm mortgages the most important part. A paper, "Women on the Farm," came next, and was followed by music.

Voted that the newspapers of Ralls county be requested to publish the papers prepared for the meeting.

NIGHT SESSION.

Mr. Waters, in presenting the subject of "Stock Feeding," said: I will not attempt to advise any system, but simply to present a few facts which may be put into practice, modified as need be to suit circumstances.

Discussion.

Ques.: At what age shall we begin feeding?

Ans.: That will depend on kind of grain. Corn will develop fat. There were shown at the Fat Stock show in Chicago calves fully ripened. Must feed young things on muscle-making foods, clover-hay, shipstuff, etc.

Ques.: What do you mean by fodder?

Ans.: All of the corn-stalk except ear.

Ques.: Have you proved that there is any nutriment in stalk below ear; is there any value in the stalk?

Ans.: Yes.

Ques.: You spoke of blue-grass as an almost perfect food; what is the relative value of blue-grass and clover?

Ans.: Clover has more muscle-making elements.

Ques.: When is the best time to cut hay?

Ans.: Not fully determined, but the prevailing opinion among scientists is that as seed is passing from milk to dough state.

Ques.: How is the Agricultural college?

Ans.: Hard to say—mixed.

Col. Splawn expressed pride in the Agricultural Experiment station getting down to business and finding out that grinding, crushing, etc., does not pay.

Ques.: What is the value of cob as food?

Ans.: Waters—When ground coarse, has no value; when ground fine does have value, but probably does not pay.

Ques.: What is the relative value of red-top and timothy?

Ans.: Red-top does not compare favorably, but can't give the relative ratio. Must, however, not lose sight of the fact that food may have qualities other than nutrients which give value: for instance, flavor. Blue-grass cut from lawn and badly damaged by sun and rain was used for bedding, and it was found that stock ate it in preference to timothy hay.

CONSERVATION OF SOIL FERTILITY.

G. W. Waters of Ralls county talked of the above subject informally and briefly.

Under the system of culture in vogue, we are hastening to soil depletion. Soil is the source of all life. There is in soil a certain store of plant food; abundance of fourteen elements, except three, potash, phosphoric acid and nitrogen, and enough of these for many crops, but they are in such condition that all cannot be exhausted at once. In thirty bushels of wheat there are one hundred and forty pounds of mineral matter of the essential plant foods. Most of this is left in bran and other coarser products of the grain, and not in flour. Only ten per cent of the essential plant food of such as are eaten by stock goes into carcass, and thus goes from the farm. Dame Nature has made wise provision for man, but we can exhaust the store.

By cultivation we expose the soil to elements, and thus prepare more plant food. We want to send away from farm as little as possible of this plant food by selling such products as contain least of them. As remarked by a neighbor, "we know better than we do." We feed so the fertility of our farms goes off down Salt river. This is the great question of the day. Some say, use commercial fertilizers. To make our land as good as comes from nature, it would require $132 an acre to supply these three elements.

A. S. Smith concurred in the ideas presented, and referred to the worn-out lands of the East now grown up to trees as an effort on nature's part to restore the fertility.

Mr. Waters: I think soil exhausted can never be fully restored. Missouri soil is hard to exhaust, is a noble soil because of retentive sub-soil.

Ques.: Will it pay to use commercial fertilizers?

Mr. Waters: We want to avoid the need of them.

Adjourned.

AUDRAIN COUNTY.

MEXICO, MO., December 19, 1890.

The Institute in Mexico was called to order by President J. A. Potts. Judge J. A. Guthrie delivered the address of welcome, to which Abiel Leonard, Vice-President elect of the Board of Agriculture, responded. Mr. Leonard, an enthusiast on the subject of the education and cultivation of the farmer, spoke eloquently of the objects of the Board and the place the tiller of the soil should occupy in the world. He was often interrupted with applause, proving how entirely he was in sympathy with his audience.

At the afternoon session, J. W. Rouse, Secretary of the State Bee-keepers' association, read a paper on "Bee-Keeping." In the discussion following, G. W. Waters and J. L. Erwin participated.

Ques.: Will bees store more honey in sections than in a box, and if so, how much?

Ans.: I don't know that they would if not attended. All things being equal, they will store as much in a nail-keg as in a Langstroth hive; but the point is that we want the hives so constructed that we can get at the inside of them at any time. By this means also the comb is built straight and is much more salable.

Ques.: Is there a moth-proof hive?

Ans.: A moth-proof hive would be also as absolutely bee-proof.

Ques.: How do you Italianize a hive?

Ans.: Use frames, open and find queen and remove; introduce after three or four hours the Italian queen and protect her for three hours, when it will be safe to release her among the bees. By waiting, the bees miss the queen and get confused. I had mine Italianized some years ago, but are now nearly all crosses.

Ques.: Some say the Black bees store the best honey; how about it?

Ans.: The largest and best producers say that the Black bee does not make any better honey. The Italian can gather honey from flowers that Black bees cannot reach; so often the Italian honey may be inferior, but better have inferior honey than none.

RAILROADS.

M. Knight, Traffic Manager of the Wabash railroad, presented a paper on the "Importance to Railroads of Good Wagon Roads."

The subject was handled in a masterly way, and the evident familiarity of Mr. Knight with the subject of railroads impressed his hearers and gave rise to the suggestion that if the farmer was as thoroughly conversant with every minutia of his line of work he would make as great a success.

Gov. N. J. Colman: I only want to approve what Mr. Knight has said in advocating good roads. From what I have seen in America and Europe, I know the remark, that we have the poorest roads in the civilized world, is true. In Germany a span of dogs and a woman can draw as much as a span of horses in America. In Germany the roads are what we might term pavements. Of course we cannot have just such roads, for the reason that we lack the material, and another serious hindrance to such roads here is the amount of frost; our roads after being thoroughly constructed will not last as they do there. We need roads constructed so they will shed water. A covering of gravel makes the best roads. Roads are of the utmost importance in getting produce to market at the proper time. With good roads we can take advantage of a rise in the market.

Mr. Erwin: What would be the cost of crushing one yard or ton of rock and the cost of transporting it?

Mr. Knight: I can't exactly state the cost of crushing, but it has been the policy of the Wabash road to make a nominal rate for transporting to localities wanting it. We would so far encourage the improvement of wagon roads.

Prof. Phillips: September last I went over the line of the Wabash railroad and examined all quarries from St. Louis to Kansas City. Determined cost of crushing rock for road ballast, after being delivered to road, to be very small indeed. The getting of rock to the crusher, including quarrying, is the main item of expense. The best quarry is at Missouri City, Clay county.

Ques.: How much does it cost to quarry a yard of rock?

Ans. (Prof. Phillips): Less than one dollar.

Ques.: Is soft rock good material for roads?

Ans.: No; yet some rock soft when quarried, hardens; other decomposes.

HOW TO CONSTRUCT ROADS.

Prof. H. Phillips, of the State University, delivered an illustrated lecture on the above subject, the text and illustrations of which will be found in this volume.

PURPOSES OF FAIRS.

Mr. George Longman, editor of Colman's Rural World, read a characteristic paper on the subject so dear to his heart, giving points about the conduct of fairs in Old England, which could be followed to advantage here.

President Potts commented on the papers read, and said any one of them would pay a farmer to drive fifteen miles to hear.

Adjourned.

NIGHT SESSION.

At the night session, J. L. Erwin of Fulton, one of the most successful dairymen in the State, lectured on dairying, which he considers the most profitable branch of farming when intelligently and energetically pursued.

In answer to various questions, Mr. Erwin gave the following facts :

I was led into dairying by keeping farm accounts. I charged up every outlay for a crop and credited it with the product. At the end of five years I found that my cows were yielding more profit than other stock on the farm. Again, I knew that I could get more land in grass, which would keep it from washing. I knew nothing of dairying, but I began reading and studying, and found that my cows yielded a profit of from thirty-five to forty dollars per year. I began in a small way, with seven cows. My first sale was to the asylum. The profit grows out of being able to dispose of all milk. At this season of the year we sell every gallon of buttermilk.

A man must be adapted to dairying, or he won't succeed. He must like his cows. Must have dry land; the quantity of food is determined by this. He can't have good milk and butter without good food.

If a man expects to make butter a specialty, the Jersey is the best, for there is less dead weight to keep up. Shorthorns weigh 1400 to 1500 pounds, while the Jersey weighs 700 to 800 pounds. The Jersey will yield as much butter, which will, of course, be cheaper. We do not get as much for offal as we used to do; the beef of cows and calves is much lower. The quality of milk will greatly vary, but on an average the Jersey will lead. If I were selling milk alone, I would take the Holstein.

Provide good shelter for cows; pine plank is cheaper than food. Pure water is a necessity; you can no more expect to make good butter with poor water than you can expect to make first-class biscuit from poor musty flour. It has been determined that three-fourths of the diseases among children are due to impure milk made from impure food. Cistern water is best, as it seems to have the capacity of purifying itself, and is of a temperature which is suitable to a cow. Regularity of feeding and milking is necessary. You wont succeed when you milk one afternoon at six o'clock and another at seven. A cow expects attention at the same time every day, otherwise she is irritated and ruined. You strike the best cow in the State and you ruin her.

In milking, wipe clean the udder, sit down on stool with bucket between knees and milk rapidly but gently.

The most certain process of raising and separating cream is by means of the centrifugal machine, when sufficient milk is handled to justify the expense. Skim milk may be carted away to the calves or hogs, but the milk is not so valuable as by the old process of skimming, for all fat is taken out and the air mixed with it so it wont keep.

After the cream is separated, it should be made cold at once and then allowed to ripen. In summer we mix sweet and sour cream in equal parts to make it ripen rapidly. It makes better butter when ripened quickly. Some claim that sweet cream butter is best, but a man accustomed to the taste of sour cream butter likes it best.

Ques.: Do you find that the milk will take up the odors of the barn while giving off animal heat?

Ans.: Yes.

To make good butter, churning must not be done rapidly; one to two hours should be taken. The temperature is raised by rapid churning, and you can't get the butter out. As soon as butter is size of fish eggs, draw off buttermilk, and throw in as much cold water as you have milk. It takes about twice as much salt when you use brine in summer time.

You want pure salt, such as does not contain lime. Dissolve a small portion in a little clear water; if it shows a white color, don't use; if solution is clear, O. K. Three-quarters ounce of salt to pound of butter is most satisfactory. Tastes differ so widely, however, that different markets require different amounts.

I find these little wooden butter trays holding from one to four pounds most economical and satisfactory for delivery to customers.

Ques.: Will butter shrink in keeping?

Ans.: Yes; but if the tub is thoroughly soaked with brine, there will be practically no loss, as the tub will not take up any water from the butter.

Ques.: Which preparation do you favor—steaming or soaking tub?

Ans.: Soaking; but I don't know how much better.

Ques.: What is the best feed for butter?

Ans.: Corn meal.

Ques.: Won't clover hay beat it?

Ans.: No; but with clover hay and corn meal I get as cheap or cheaper butter than with bran or shipstuff.

MORNING SESSION.

MEXICO, December 20, 1891.

Abiel Leonard presided.

H. J. Waters read a paper on stock feeding, illustrated by figures from experiments, showing why and how necessary is early maturity.

Dr. E. D. Porter, Dean of the Agricultural college, addressed the meeting on the "Relations Existing between the State University and the College of Agriculture." The Doctor's plan for having buildings erected on the College farm for the special use of the college students, where they could have the benefit of any supplemental course in the University they might wish, but yet in the study of agriculture be entirely free from all distracting influences, met with enthusiastic approval.

An animated discussion followed the address, in which Dean Porter, Abiel Leonard, Levi Chubbuck and J. L. Erwin participated.

AFTERNOON SESSION.

The afternoon session was devoted to the "Horse."

Thomas Lafon, of Columbia, read a fine paper on the "Trotting Horse," followed by J. A. Potts on the "Saddle Horse"—both of which papers, found elsewhere in this volume, are very interesting.

Governor N. J. Colman delivered a lecture on the "Horse," in the course of which he said:

> The subject of the "Horse" is of more importance than most people imagine. I think the present census will show 16,000,000 horses in the United States, the value of which is over one billion of dollars.
>
> While at the head of the National Department of Agriculture I hoped to do more for the horsemen than I found possible under the circumstances. The cattle industry was in jeopardy from pleuro-pneumonia, which existed in many parts of the United States. I was determined to eradicate the dread disease, and at the expiration of my term of office it existed only in Kings county, New York. When in England I found cattle worth three times what they were here. We were so anxious to open a field for American cattle that all resources were bent to that end. I, however, did what I could to have prepared a volume on the "Special Diseases of the Horse," now about to be issued.
>
> The horse-raising industry puts more money in the Kentucky pockets than all the rest of their crops and stock. Seeing that it was a good thing for Missouri, I advocated the organization of the Horse Breeders' Association. The annual meeting of the Missouri Association will be held in this city, December 30, and we want the co-operation and sympathy of all Audrain county farmers. This is one of the best localities in the State for breeding.

One of the best horses on the turf last season was McDowal or Sedalia Boy, a Missouri horse.

Our business is overdone in many directions, but not in lines of horse-raising, and we should produce the best.

In this industry we should get right, go slow at first, study kind of food, feeding that which will make bone and muscle, and never shelter under wire fence.

Begin handling while young and train rather than break, for the horse is a very intelligent animal and highly appreciates kindness.

NIGHT SESSION.

At night the session was of special interest, the first paper on the program being on "A State Fair," by C. F. Clark, of Mexico.

Mr. Clark has been an earnest advocate of the establishment of a State Fair for some years, and when a member of the 35th General Assembly, worked hard for an appropriation for this purpose.

Judge J. H. Fulbright and A. P. Blake, of St. Louis, heartily indorsed the position taken by Mr. Clark.

"Roads an Important Factor in Civilization" was the subject of an excellent paper by Professor H. C. Penn, of the Missouri University.

G. D. Purinton, professor of biology in the M. S. U., talked entertainingly on "Plant Fertilization," giving both interesting and valuable practical information, illustrating his points by the use of a magic lantern.

With mutually complimentary expressions from the citizens of Mexico, the Board of Agriculture and other persons from a distance, who contributed to the success of the Institute, a final adjournment was reached.

JOINT MEETING OF THE COMMITTEES

From the Board of Agriculture and the Board of Curators of the State University.

During the progress of the Institute in Mexico the committees consisting of Judge G. F. Rothwell, Judge G. B. Macfarlane and J. R. Rippey, of the Board of Curators of the State University, and Governor N. J. Colman, Judge J. H. Fulbright, B. O. Cowan, Abiel Leonard, Dr. E. D. Porter, Levi Chubbuck, Secretary, and President J. A. Potts, of the Board of Agriculture, held a joint meeting to consider a measure which had been prepared to submit to the Legislature, providing for the reorganization of the Board of Agriculture, suggesting the transfer of the veterinary service from the control of the Board of Curators to that of the Board of Agriculture, and creating in the Board of

Agriculture an examining committee whose duty should be to make report of the condition of the Agricultural college and Experiment station for publication in the annual report of the Board.

The measure was carefully considered, section by section, and as agreed upon by the joint committee, was submitted to the Legislature and is now the law.

The President and Secretary of the Board of Agriculture were directed to submit the measure to the Governor, who approved and in his message recommended its passage to the General Assembly.

FRANKLIN COUNTY.

NEW HAVEN, MO., December 31, 1890.

Mr. J. T. Connally presided as chairman of the Franklin county meeting.

Mr. J. Y. Sawyer, of Illinois, was the first speaker. Discussing the subject of dairying, he spoke of two objections that were made against the business. "It is too confining," some say; "they don't want to be tied to a cow's tail for 365 days in a year." But that is better than to have a millstone in the shape of a mortgage tied to ones neck. Others say, dairying doesn't pay. That depends on what we expect. Not many millions are made in dairying, but he had noticed that there was less kicking and more content among dairymen than among other classes of agriculturists. The importance of the dairy interest has not been appreciated in this country, and as a consequence, it has not had the assistance and encouragement it should. So, too, the average farmer has not fully understood what the cow was capable of doing for him if properly cared for. If a cow gives about 3,000 pounds of milk a year, that is only enough to meet the cost of keeping, and there is no profit; but if by feeding and caring for her better, the yield is increased to 4,000 pounds, there will be a profit.

It is the butter-fat in the milk that we are after, mainly. The amount of this that the milk contains will depend, first, on the individual cow; second, on the food and care given. Then, having got the milk rich in butter-fat, the next thing is to get the fat out. This is best done by means of the centrifugal separator.

Mr. Sawyer then proceeded to show the operation of the machine.

Mr. C. W. Murtfeldt, of St. Louis county, continued the discussion of the subject. He had sold butter in St. Louis from 10 to 25 cents above the market price, because it was better than the best creamery

He claimed that a private dairyman can make a better article than can the creamery man, because the former can control all of the conditions under which the milk and butter are produced, while the creamery man can only control the conditions after the milk has been received at the factory. The cause of failure in dairying is often that the would-be dairyman fails to get ready for the business. He must be prepared to take care of his cows so that they will always be comfortable and well supplied with water and food.

As to dairying being confining, it is not more so than any other business well followed. It is the best article that yields the most profit, and the best can only be secured by perfect cleanliness.

Mr. Homer Calkins read a paper on "The Mutual Relations of the Town and Country."

S. S. Bailey presented a paper on "Rotation of Crops."

Joseph Soph and M. E. Armstrong, papers on "Bee-Keeping." In remarks on the last paper, it was stated that bee-keeping can be made to pay by using energy and studying the business. It can be combined with other lines of farming. The raising of queens for sale is profitable. Since the introduction of Italian bees our knowledge of bees has greatly increased.

Ques.: How do you winter bees?

Ans.: I leave them on the stand, but see that the swarms are strong and well supplied with honey—say 20 pounds to the hive for the winter.

Mr. Walton was called on to discuss the subject of "Horse Breeding." He said it was one of the most important subjects in connection with the farm. We need horses on the farm that can repeat themselves: that is, can do a good day's work and follow it up with others. Many horses can't do this; they will do one good day's work, but that exhausts them. We want an active horse on the farm, one on which a man can head off a cow. He must have good feet and legs, good eyes, be well and compactly built. The best combination for such a horse is a good four mile race-horse, crossed on the best mares we can get.

Ques.: How about the Morgans?

Ans.: The large strains are good.

Ques.: And the Normans?

Ans.: They are good to sell, but they are apt to be off their feet and blind at 9 years old.

Ques.: What is the cause of so much blindness in horses?

Ans.: I think it is due largely to musty hay and dark, unclean stables.

Prof. W. S. Allen read a paper on "Education," after which a committee was appointed to draft resolutions to present to the General Assembly, asking for a larger appropriation for the Board of Agriculture.

NIGHT SESSION.

The local program was continued.

J. T. Connally's paper on "Sheep Husbandry" was read by Mr. Diggs.

Mr. Armstrong asked if lambs should be dropped early or late.

Ans.: Early if one is prepared to take care of them.

The question of how to prevent destruction of sheep by dogs was discussed at considerable length.

Mr. Davis suggested fox hounds as protectors of sheep.

Mr. Allen Clark presented a paper on "Country Roads," and in the same connection Mr. Davis read a communication from Charles Moore, county surveyor.

Mr. Clark was invited by the Board of Agriculture to attend the closing meeting of the series, to be held at Jefferson City, and present his paper on "Roads."

Adjourned.

ST. LOUIS COUNTY.

The first Farmers' Institute of St. Louis county was held at Clayton on January 2, 1891, under the auspices of the State Board of Agriculture. The very rapid fall in the temperature on the day previous, being for several hours 3° per hour, caused many who had to travel by road 20 to 25 miles, to dread to risk the trip, and thus the attendance was considerably reduced. The day of the meeting was, however, fine, and there was quite a company of the old farmers present and many of the young inquiring minds. The State Board was represented by the Secretary, Levi Chubbuck, of Columbia; J. L. Erwin, of Callaway county; Judge Samuel Miller, of Bluffton; ex-Gov. Colman, of St. Louis county, with J. Y. Sawyer, of Chicago, Illinois, C. W. Murtfeldt and Wm. Muir, of St. Louis county, by special invitation. Dr. Paul Paquin, State Veterinarian, was called to St. Louis by the illness of his wife, and some of the other members of the Board had to proceed to Rolla to hold an Institute there on the 3d.

A large package of State reports was distributed but did not meet the demand, so another package will be sent to Wm. C. Wengler, county clerk, at Clayton, and one to Wm. Muir, at Fox Creek, embracing copies of the German edition. The meeting was organized with M. B. Greensfelder in the chair and Secretary Chubbuck at the desk.

J. Y. Sawyer, of Chicago, Illinois, then addressed the meeting on dairying, going all over the details of animals, breeds, feed, milking, handling the milk, extracting the cream and setting the milk, making some most interesting experiments with the " Babcock testing apparatus," to determine the amount of butter-fat existing in the different samples of milk, and hence, the butter value of each cow—ten per cent or ten pounds of butter to 100 pounds of milk being the greatest, and varying from 2½ to 10 per cent. The samples tested by Mr. Sawyer, obtained from Mike Fortin, of Clayton, from a small Jersey cow kept in his yard, gave the maximum of ten per cent. The De Laval cream separator shipped from New Haven did not reach in time for the meeting.

At the afternoon session, Mr. Greensfelder having been called away on business, the chair was occupied by Mr. L. D. Votaw, of Eureka, a true native-born Missouri farmer, born on the banks of the Meramec river nearly 73 years ago, and still on the farm where he was born.

C. W. Murtfeldt addressed the meeting on "Butter-making" and the conditions essential to perfection in the art. A very instructing address.

Ex.-Gov. Colman, having to leave the meeting early, was called on and addressed the meeting with his usual eloquence. He noticed the many wastes and leaks on the farm, advocated dairying and stock-raising as especially adapted to keep up the fertility of the farm instead of selling off the crops, making the farmer a manufacturer of the crude products and returning the waste products to the farm so as to maintain its fertility. He was enthusiastic on raising trotting stock, giving extensive sketches of his experience in this and European countries on the possibilities of farming in this country.

J. L. Erwin, of Callaway county, on the general subject of dairying from an experience of 17 years on the same farm and handling daily the milk of 40 cows. His details were clear, comprehensive and liberal. He wanted perfect cleanliness, good cows, breed not so important; approves of the use of the "milk test" as determining the butter value of the animal, discussed the relative value of deep and shallow "setting" in relation to temperature, the churning, salting, handling and packing from his own experience. During all the meeting, numerous questions were asked and much information brought out by the audience.

Wm. Muir, of Fox Creek, then read a paper on "Dairying, especially Cheese Making, the Promising Industry of the Uplands of our State."

Mr. Erwin then read a most instructive paper by Mrs. Erwin on "Poultry Culture," from an experience of a life-time on the farm, embracing most of the breeds and finally settling down to the Plymouth Rock. Statistics were presented of income and expenditures of a flock of 100 hens, showing quite a good profit.

Judge Samuel Miller gave one of his interesting talks on "Fruit-growing," going over the entire range and giving much interesting and highly practical information.

The railroad connections and distances to be traveled began to thin the meeting, and an evening session was reluctantly given up.

The court-room, at one period of the session, was so crowded that the chairs from the circuit court room had to be brought in to seat the audience. The want of the presence of the ladies was greatly felt.

The following closing resolutions were adopted:

Resolved, that the thanks of this meeting are pre-eminently due to the excellent lady who has graced this meeting with her presence and set a noble example to our sisters all around that will yet be emulated in the near future.

Resolved, that the thanks of this meeting are due and are hereby tendered to the State Board of Agriculture, as officers, and the gentlemen with, us for this notable opportunity of becoming acquainted with them and their views and methods, and for the valuable information we have received; and, we sincerely trust that our county will be frequently found on the plan of "Institutes."

Resolved, that the thanks of this meeting are due and are hereby tendered to the newspapers of our county, the Argus and the Watchman, with the Rural World and Journal of Agriculture, of St. Louis, for their liberality in announcing the meeting, and their kindly and encouraging notices.

Resolved, that the thanks of this meeting are due and are hereby tendered to the judges of our county court for their promptness in placing this room at our disposal, and making it so comfortable for our meeting.

Resolved, that the thanks of this meeting are due and are hereby tendered to Emil Dosenbach, the worthy sheriff, for his courteous attentions during our meeting.

On motion, the meeting adjourned, and thus ended a truly fraternal as well as educational "Institute."—*Wm. Muir, in Clayton Argus.*

PHELPS COUNTY.

From the Rolla (Mo.) New Era.]

The Farmers' Institute held by the State Board of Agriculture in this city Saturday, Jan. 3, was an interesting occasion to those who attended. There were three sessions held in the Grant hotel opera house, forenoon, afternoon and night, at all of which representative farmers of Phelps county were present.

Hon. Wesley Via called the house to order for the opening session, and in a few words stated the purposes of the meeting. It was, he said, one of a series of institutes held by the Board of Agriculture at different points in the State. They are intended as a means of conveying to the farmers information of practical application to, and value in, the business of farming, and the farmers were urged to attend and take an active interest in the proceedings.

Levi Chubbuck, Secretary of the State Board of Agriculture, was introduced, who explained still further the status of the Board and its different lines of work. The Board of Agriculture, said the speaker, is one of the State departments, having its existence in the laws of the State equally with other state departments located at Jefferson City. Recognizing that agriculture is the foundation on which all other industries must rest, that no other class can long be prosperous when the farmers are not, and that the prosperity of the farming class is dependent on the degree of intelligence existing among them, the legislative powers felt warranted in creating a Board of Agriculture, the duties of which should be the gathering and disseminating of information among the farmers, and to do whatever was possible to do to develop and advance the agricultural interests in the State. These Farmers' Institutes were an important means to that end. The farmers were invited to attend and take part in the discussion of practical farm topics, to the end that they might get ideas which, if applied to their business of farming, would make it more profitable. The Board of Agriculture arranges with men who have made a special study of distinct lines of agriculture to attend and tell how they have attained success. It was expected that all present would be free to take part in the discussions, to ask questions for further information and to give results of their own experience.

Mr. J. L. Erwin, of Callaway county, one of the most extensive and successful dairymen in the State, was next called on to discuss the subject of Dairying. This he did in a half-hour talk that was replete with valuable facts and suggestive thoughts to every thinking farmer, whether he be a dairyman or not. Mr. Erwin said he was led into dairying by keeping farm accounts. The figures showed him that his cows, without any special care, were giving a better return for the capital invested and labor involved than anything else on the farm. He concluded that if they did so well under ordinary care they would do better under special care, and so began to turn his attention in that direction. An important point in favor of dairying is that it affords one of the best and cheapest means of restoring and maintaining the fertility of the soil. Profits in farming are best gotten from the fewest possible number of acres of the richest possible land. Eighty cows will, if properly handled, make enough manure in the course of a year for fifty acres of land. He advised taking the manure direct from the stable to the field and spreading on grass, and does not plow under. The dairyman should grow lots of clover, as it is one of the best of foods to mix with such foods as corn fodder and straw, being rich in the elements that the fodder and straw are lacking. With beef as low as at present, it will not pay to keep a cow that will only give a moderate quantity of milk and butter, but which can be turned off for beef. That cow is the most profitable dairy cow which gives the most milk and butter, and when past usefulness in this direction must be thrown away as a piece of worthless machinery. On testing his herd of ninety cows, he found there was a variation of from 2½ to 6 per cent of butter-fat in the milk, which was clear proof that a number of his cows were giving milk so poor in butter-fat that they were being fed at a loss, thus reducing the profits on the better cows. He at once disposed of eighteen of the poorest ones.

The dairyman must expect to work 365 days in the year just as in any other business if success is to be attained, and he must have a love for the business. It is a business in which success is dependent on small things. He regarded his manure pile as his profit. By means of this he had trebled the productive capacity of his land.

Cows must be kept comfortable, handled gently, and be given an abundance of pure food and water.

At the opening of the afternoon session Judge Samuel Miller, the well-known horticultural writer for Colman's Rural World, and veteran fruit-grower in Montgomery county, addressed the audience on the subject of fruit-growing. He regarded Missouri as the equal of any State in the Union for fruit-growing, not even excepting California. The Ozark region, he said, was the best part of Missouri for the industry. Many valuable facts were given of much importance to those in this section who are turning their attention in this direction. The growing interest in fruit-growing and in fruit-raising were shown by the many suggestions asked.

Mr. J. Y. Sawyer, an expert dairyman from Illinois, was the next speaker, who occupied a half hour in explaining in an interesting manner the composition of milk, different systems of setting and raising cream, and concluded by going through the operation of testing some samples of skim, butter and whole milk, to show what per cent of butter-fat each contained. The testing was done with a Babcock tester, and was an interesting feature of the meeting.

The night session was opened with a paper on stock-breeding by Prof. H. J. Waters, assistant Agriculturist of the Agricultural Experiment station at Columbia. Some interesting and instructive figures were presented on a chart which showed conclusively that the younger and smaller any meat animal is sent to market the greater will be the profit, for it takes less food to put a pound of gain on a smaller animal than on the larger animal.

Mr. Sawyer showed the operation of a hand milk separator by running a few gallons of whole milk through a separator that he had at the meeting, and separating the cream from the milk.

Mr. Via was called on to make a few remarks on the subject of "Improved Roads." He kindly responded, and showed that he had given this important subject exhaustive study, and is prepared to act intelligently as a member of the Legislature.

A general discussion followed and concluded the exercises of what is regarded by all those who attended as a very interesting and profitable occasion.

Dr. Frost improved the opportunity of urging more liberal support by the State for the Board of Agriculture, so it might carry on its work on a larger scale.

LACLEDE COUNTY.

From the Lebanon (Mo.) Rustic.]

LEBANON, MO., Jan. 5, 1891.

The State Board of Agriculture held a two days' session in Lebanon Monday and Tuesday of this week, which the members of the Board pronounced the best meeting ever held in the State. The brilliant success of the meeting is a high compliment to the enterprise, intelligence and progressiveness of our farmers. It will be chronicled to the honor and credit of Laclede county. The meeting throughout was most interesting and profitable, and its importance and success demands the attention and space The Rustic gives it. The sessions were largely attended, the farmers manifesting much interest and participating in the proceedings. The ladies, farmers' wives and daughters, also added their presence and interest to the meeting. The papers were all able and practical, treating a great variety of farm topics, and the discussions brought out interesting views and experiences.

AFTERNOON SESSION.

The meeting was called to order promptly at 2 o'clock at the court-house by A. Nelson, president of the county society. There was a large attendance of farmers, the court-room being well filled. It was pleasing to note the large attendance and presence of our representative farmers, all manifesting much interest in the meeting.

The address of welcome was delivered by Mayor C. C. Clendenin, and was eloquent and well chosen.

Hon. Levi Chubbuck, Secretary of the State Board of Agriculture, responded in a pleasing manner, in which he spoke of the objects and aims of the meetings and mission of the State Board.

The first paper on the program was by Judge W. R. McIlvaine, of Phillipsburg; subject, "Clover: its Relation to Agriculture and Horticulture." It was an excellent paper, and the speaker treated the subject from long experience and experiments, presenting some valuable suggestions. In regard to time for sowing, he recommended early spring as the best time, not later than the last of February. He thought that to sow when snow was on the ground was the best time. In treating hay, he thought the best time to cut it is when it is in full bloom. His suggestions in regard to fertilizing were very good. He thinks the poorest land we have can, by proper attention, be made productive. Clover seed is one of the most profitable crops we can raise.

Mr. J. Y. Sawyer, of Chicago, asked if clover took more from the soil than it added. Judge McIlvaine thought clover was exhaustive to the soil. It is a crop that should be rotated.

Judge Samuel Miller, of Bluffton, Mo., thought the paper read answered the question. The deep roots of the clover give drainage and moisture to the soil.

J. L. Erwin, of Fulton, said the crop must be well matured to get the best results. He said the farmer who plowed down his clover simply wasted his crop. He would as soon think of plowing down wheat as clover.

Judge McIlvaine said if Bro. Erwin never plowed down clover he didn't know its benefits.

Mr. Erwin replied that he had plowed under clover.

Judge Miller said the largest yield of wheat ever made in the United States was on land on which the clover crop the year before had been plowed under.

Levi Chubbuck thought that in regard to clover-sick land there might be other causes to prevent failure of crop.

Martin Blickensderffer said he always got the best results from early cutting.

Levi Chubbuck said that at the State Agricultural college they always sowed a light crop of oats with clover and got the very best results.

J. C. Evans, of Harlem, Mo., thought there could be no such thing as "clover-sick land" with clover on it.

Jacob Blickensderffer said he was a civil engineer by profession, but was the son of a farmer and had owned a farm many years. He related briefly his experience in farming in an interesting manner. He said he used to use plaster as a fertilizer and didn't know anything else. He found plaster a benefit from actual experience.

Mr. Erwin said he had tried plaster in Callaway county, but found it to be of no benefit at all on wheat, corn or clover.

The paper brought out a lively and interesting discussion.

The next paper was by Harrison Bowman, "Orcharding in Waste Places." The speaker related his experience in orcharding, and the success he has attained in the "waste places" of Laclede county. He now has a splendid orchard in a "stony place," and it is a profitable crop. His paper was well received.

Judge Miller, of Bluffton, Mo., said "orcharding in waste places" was a most interesting subject to us all. Every farm has its waste places, which can well be utilized in orcharding. He thought Mr. Bowman had handled the subject well.

Mr. Evans, of Harlem, said the red land was the waste places, and it was the very best soil for orchards.

Mr. Serl, of Lebanon, said his experience was that the red soil was the very best for orcharding.

Mr. Sawyer, of Chicago, said that he was struck with the remarkable success Mr. Bowman had with his orchard; out of four acres he didn't lose a tree. With that kind of success farmers will all succeed.

Mr. Evans: Mr. Bowman handled his trees just right. That was the secret of his success.

F. S. Bevier, of Lebanon, thought the black-jack land of Southwest Missouri was the best for orcharding.

G. W. Waters, of Ralls county, read an interesting and valuable paper on "Soil and Fertility," treating the subject in a scientific manner. He said that if we arrive at the correct principles of nature we have the key to successful farming. He suggested feeding out in the fields as a source of fertility. The tramping in all kinds of weather does not injure the land. We must pay back to the soil the fertility we are year after year taking from it.

The paper was discussed by J. L. Erwin, of Fulton; Judge McIlvaine, of Laclede county; J. Blickensderffer, Laclede county; Judge Sam Miller, of Bluffton, Mo.; J. C. Evans, of Harlem; G. W. Waters, Ralls county; Levi Chubbuck; C. L. Palmer, Lebanon; C. W. Murtfeldt, St. Louis; J. W. Sawyer, Chicago, and F. S. Bevier, Lebanon.

J. Y. Sawyer, of Chicago, read a very interesting paper on "Dairying in Southwest Missouri." He discussed the subject in a practical way, and spoke in glowing terms of Southwest Missouri for dairying. He said there was no finer dairy country anywhere. The subject was also discussed in an able and entertaining manner by C. W. Murtfeldt, of St. Louis.

Adjourned until 7:30 o'clock.

NIGHT SESSION.

The first paper of the evening session was by E. B. Kellerman, "A Higher Grade of Education Applied to Agriculture and Fruit Growing." Mr. Kellerman handled the subject in an able and interesting manner. It was one of the best papers of the meeting. The paper was well discussed by C. W. Murtfeldt of St. Louis, and G. W. Waters of Ralls county.

M. W. Serl, of Lebanon, read a highly entertaining and instructive essay on "Ornamentals and Tree Planting." It was closely listened to, and was well received.

C. W. Murtfeldt, of St. Louis, gave an interesting fifteen minutes' talk on "Social Life on the Farm." The speaker gave some excellent suggestions on how to make it pleasant and attractive. He thought the lives of the farmer and his family should be the most pleasant and happy. The boys should stick to the farm and avoid city life. His remarks were heartily applauded.

J. L. Erwin, of Fulton, Mo., made a few remarks. He said the drones were not all among the farmers. There was no drudgery about labor, and the speaker brought out the attractions and successes of farm life.

E. B. Kellerman made a few remarks pertaining to his paper. He thought professional men should not be assigned to the discussion of farm topics.

Dr. R. D. Shannon gave a short, interesting talk, and was called on frequently during the evening in answer to questions.

Short talks were made by Ex-Gov. Norman J. Colman, Levi Chubbuck, C. W. Murtfeldt, Judge Miller, J. C. Evans and J. L. Erwin.

Mr. Chubbuck advocated a change of course of study in our country schools, looking to the teaching of practical farm branches. Gov. Colman agreed with the views of Mr. Chubbuck.

Dr. Shannon said it was the fault of our school officers that such branches were not now being taught in our country schools.

The evening session elicited a lively discussion that was enjoyed by the audience. The court-room was crowded, many farmers of the county being present.

MORNING SESSION.

The first thing Tuesday morning was an excellent discussion on "Dairying in Missouri from a Farmer's Standpoint," by J. L. Erwin, of Fulton, Mo. He presented the subject in a practical manner from long experience. His remarks abounded in good suggestions, and all who heard him were benefited by the able manner in which the speaker treated the subject. He spoke of the injurious effects of impure water on man and beast alike.

Some one suggested that Lebanon was well supplied with pure water. The speaker replied that it was a God-send to the community, and he wished that every community was as fortunate in that respect as Lebanon.

M. W. Serl spoke of the value of pure water and the great benefits derived from it. Having given the subject much study, his remarks were of an interesting character.

Dairying and fertilizing was discussed in its various phases by Messrs. J. Blickensderffer, C. W. Murtfeldt, Judge McIlvaine, Judge Miller, Norman J. Colman and others.

"Dairying in Southwest Missouri," was the subject of an able and instructive discussion by J. Y. Sawyer, of Chicago. He spoke of the value of proper treatment, or the cow, food, etc., to produce the largest amount of butter-fat in the milk. This varied according to the cow. He explained the separator system of raising cream. The milk from the cow goes direct to the separator and the cream comes out nice and sweet, and by the separator system you get a much larger per cent of cream than by any other method. As soon as you have enough for churning, see that the temperature is just right, and you will get the very best results.

C. W. Murtfeldt, of St. Louis, discussed the same subject, presenting the creamery question. He said he was looking for the creamery that was proving satisfactory to the managers and patrons. He was still looking for such a creamery. The speaker's maxims for milkers were excellent and concise. They were:

MAXIMS FOR MILKERS.

Be gentle with your cows; remember you are a man and they are brutes; be not thou a brute.

Give your cow a name and call her by her name; she will learn to know it sooner than you think.

Never feed your cow while milking; one thing at a time; make her pay attention to you and not to her feed.

If you have more than one cow, always milk them in the same order; a boss cow does not like to be slighted.

Clean your stable before you milk. I know of no substance that will take up bad odors sooner than milk.

Clean your cow with brush or cloth before you milk; perfect cleanliness is most essential to perfect dairying.

In cold weather wash your hands in warm water before you milk; a cow's teats are very sensitive.

Have no conversation while milking, nor stop at a "what did you say?" from your fellow-milker.

Milk as rapidly as you can and as clean as you can; if you do not your cow wil dry up.

Strain your milk from a strainer pail into an independent strainer, and in this have besides a strainer cloth.

A good strong milker ought to milk ten cows in an hour, but he has not time to carry the milk to the dairy.

Have all your milking apparatus scrupulously clean; milk being a fatty substance, you may need pure soap in the cleaning; use scalding hot water afterward.

Be sure and keep your finger-nails short, always.

Give your cows a table-spoonful of salt once a day in their mess of mill-feed; it will keep them in good health.

A cattle chain or a strap with a snap is a better tie than the old-fashioned stanchion.

A warm and comfortable stable will save feed, and straw or dry leaves are softer than oak plank.

Remember that a cow is like a closet or cupboard; you can take nothing out unless you put something in.

In cold weather take the chill from the water you use in messing cows; they will like it better.

If you want the best results from your cows, feed them all they can assimilate and digest, but remember it takes close watching to reach that point.

If your cow is in heat, present the male as soon as possible, and separate her for that day from the herd.

Handle your heifers every day and make them gentle; it will save much trouble when they become fresh.

Never drive a cow nor a fattening steer faster than a slow walk.

You have no use for a dog on a dairy farm, except it be a well-trained collie.

Sell your kicking cow to the butcher; she has no value in the dairy.

Never wet your fingers while milking, especially with milk.

He spoke of the value of the Jersey cow as a milker. The question of endurance was most important. There was no use of keeping a walking hay barn or corn crib on your farm, when you can get the Jersey cow.

J. C. Evans asked what breed of cow will give the greatest per cent of butter-fat for the same amount of food. Mr. Sawyer, of Chicago, answered: The Jersey or the Holstein.

The next paper was by Thomas Lafon, of Columbia, Mo.; subject, "The Trotting Horse." The speaker showed a thorough knowledge of the subject, and presented it in an entertaining style. He explained the "standard trotting horse," claiming that through an association of Eastern breeders the standard was fixed, and the horse that was registered as standard was worth more money than the same horse would be that was not registered as standard. A qualification of the farmer's horse is that he should be a roadster. Another qualification for the farmer's horse is the kind that sells well. The paper was well received.

Hon. Norman J. Colman, of St. Louis, next discussed "Horse Breeding in Missouri." Before getting into the subject he diverted in happy style, congratulating the farmers of Laclede county on the grand success of the meeting in Lebanon, which he said was the best meeting held in the State. He complimented the president, Mr. A. Nelson, on his untiring efforts to make the meeting the success it has been, and to Mr. Nelson much credit and praise is due. He said that with such men in the community, the educational work among farmers was advancing. Laclede county had shown greater interest in the meeting of the State Board of Agriculture than any other county in the State. Laclede county should be proud of the intelligence and progressiveness of her farmers. He spoke of the attractions and loveliness of Lebanon, her magnificent hotel and wonderful magnetic water, pronouncing Lebanon and Laclede county a favored spot of the great State of Missouri.

Gov. Colman discussed the question of horse-breeding in its varied phases, treating it in a practical way. He thought the breeder was doing great good, and he knew of no business more pleasant or profitable than horse breeding. It pays to raise the very best of everything. Fine horse breeding was especially profitable. There was also a good market for the best horses and they command high prices. There was a fair demand for draft horses, but it was not the horse for Southwest Missouri. They can't stand the hills and rocks. He said the horse must have brains as well as man. In selecting a horse, take the horse with a broad head and intelligent look. Europe, he said, was a thousand years behind the ingenious Yankee in horses and vehicles. He thought the American roadster was the coming horse of the world. Mule raising, he said, was all right. There was nothing more profitable than mules. He advised the farmers to get good mares and breed to good stallions, and gradually get into full-blooded stock. He thought the roadster was the best horse for all purposes.

Adjourned until 2 o'clock.

AFTERNOON SESSION.

There were a number of ladies from the country present during Tuesday afternoon's session, who manifested marked interest in the meeting. President Nelson called the meeting to order promptly at 2 o'clock.

The first paper of the afternoon was by H. J. Waters, assistant Agriculturist of the Experiment station of the State Agricultural college, Columbia, Mo. Subject, "Live Stock Feeding." The paper was read by Levi Chubbuck, Secretary of the State Board. It treated the subject in a practical and instructive manner, and was clearly illustrated by a map showing experimental feeding. The writer thinks heated, steamed or chopped feed does not pay. He recommended good shelter for stock. The period of maintaining an animal should be made as short as possible. The figures on the map showed the cost per pound of hogs at different weights. It showed that the cost at the heavier weight of the hog was nearly double the cost at the lighter weight, demonstrating that nothing is gained by the owner in long feeding, proving that the hog should be killed as soon as in condition. Long feeding does not pay.

Another table was exhibited showing the value of full feeding, demonstrating that it pays to feed above the maintenance point. Over-feeding is always at a loss. The paper was made clear and interesting by means of the illustrations.

COMMITTEE ON RESOLUTIONS.

A committee on final resolutions was announced by President Nelson, as follows: C. W. Murtfeldt, St. Louis; J. C. Evans, Harlem, and Jacob Blickensdeffer, Oakland.

The next paper was by Dr. J. B. Atchley, of Lebanon, "Orcharding on the Ozarks." The speaker gave his experience in orcharding, treating of the apple tree at length, from the planting to the bearing stage. He said the orchard, to be successful, must be cultivated. Corn, he thought, was the best crop that could be planted in an orchard. His experience was against the sowing of small grain in an orchard. He touched upon pruning, and gave some good suggestions. The best orchard land in this section is a yellow, gravelly soil. He said the Ozark Plateau of Southwest Missouri was the best apple country in the world.

J. C. Evans, of Harlem, said the paper treated the subject so well that there was nothing left to discuss. He paid Dr. Atchley the high compliment of saying that the paper was one of the best he ever heard on orcharding. Mr. Evans is authority on fruit-growing.

Gov. Colman said his experience did not agree with Dr. Atchley that fresh holes were the best for planting.

Mr. Evans replied that the Governor was not familiar with the soil of Southwest Missouri. It produced the finest fruit under any circumstances.

"My Mistakes in Fruit Planting," was the subject of a good paper by Frank S. Bevier, of Laclede county. He had had a varied experience in orcharding, and his mistakes in planting had been demonstrated to his own satisfaction. He found ashes, soap and coal-oil a preventive for borers and rabbits, and beneficial to the trees, making them healthier and giving the fruit better color. "One of my greatest mistakes," said the speaker, "was in believing all that the fruit-tree peddler told me." These men, many of them, never planted a tree and know nothing about it. The Rhode Island Greenings, Bellflowers and Ben Davis have been my most successful varieties, and I think are the best paying varieties.

Mr. Erwin thought the writer was still laboring under a great mistake in not plowing his orchard every year.

Col. M. W. Johnson read a very excellent paper on "The Benefits of Spraying Fruit." "If the destructive enemies," said the speaker, "are not combated they will take the land." He said that a few years ago he had some of the finest fruit grown anywhere, but the ravages of the enemy were soon felt and we were almost vanquished. The plum, the blackberry and the pear have almost disappeared with the onward march of the foe. Spraying, he thought, was the remedy to stop the destructive ravages of the insects that so seriously affect our fruits. He recommended a proper solution of London purple and water, well sprayed, as the most efficacious remedy against the combined insect family. He has sprayed as high as 2,000 trees per day. We have better fruit crops, we are told, than our neighbors, who do not spray their orchards. The paper was one of the best of the meeting and received the closest attention.

Gov. Colman heartily indorsed Col. Johnson's paper. He said that during his administration of the Department of Agriculture he had given that subject special attention, and had used his best efforts to have the spraying system generally introduced. He thought it was the greatest question for the consideration of the horticulturist. The insect family must be exterminated, and spraying was the only weapon for the warfare.

Mr. Murtfeldt thought President Nelson had made no mistake in selecting Col. Johnson to treat the subject of spraying. He said it was the best paper on that important subject he had ever heard.

I. N. Newkirk's paper on "Wool Growing and Sheep Husbandry" treated the subject in a very practicable manner, and his views were valuable suggestions of a successful sheep-raiser. He said sheep-raising had always been profitable. It should be encouraged. The curse of the flocks is the dogs, and he favored extermination of the sheep-killing curs. Sheep-raising was not alone valuable in wool-growing, but in mutton as well. The Merino, he thought, was the best breed for all purposes, having spent nearly a life-time in Merino culture. He recommended the use of the shot-gun until every sheep-killing dog in the country was wiped out of existence.

Chas. L. Palmer, of Lebanon, thought that as long as the people considered dog-raising more profitable than sheep-raising, the latter industry would not be profitable. We would soon have more dogs than sheep.

"Horticulture from Different Standpoints" was ably discussed by Judge Samuel Miller, of Bluffton, Mo., and J. C. Evans, President of the State Horticultural Society. Judge Miller spoke briefly, describing in well-chosen words the culture of fruits and flowers, and the intellectual culture in the farmer's home where such things are encouraged.

This completed the program of the most pleasant, profitable and interesting meeting of the State Board of Agriculture ever held in the State.

RESOLUTIONS ADOPTED.

C. W. Murtfeldt, of St. Louis, chairman of the committee on final resolutions, submitted the following, which were unanimously adopted:

Resolved, That it is the opinion of this Institute that the Legislature should be more liberal in its appropriations to the State Board of Agriculture.

Resolved, That the Legislature be asked to pass more stringent laws in regard to the killing of birds common to the farm and orchard.

Resolved, That our grateful acknowledgments are hereby tendered to the St. Louis and San Francisco Railroad company, and to Mr. D. Wishart, General Passenger Agent, for the courtesies extended to members of the State Board of Agriculture and other helpers in the Farmers' Institute held at Lebanon, Laclede county, Mo.

Resolved, That the unusual success of the institute is due to the efforts of the Lebanon press, the Rustic, Republican and Sentinel, and to the St. Louis Republic and Globe-Democrat.

Resolved, That our heartfelt thanks are also due and gratefully tendered by the members of the State Board of Agriculture and other helpers and visitors, to the citizens of the beautiful and enterprising citizens of Lebanon generally, for their magnificent hospitality.

C. W. MURTFELDT,
J. BLICKENSDERFER, } Committee.
J. C. EVANS.

After the report of the committee on resolutions, several pretty little closing speeches and expressions of thanks and congratulations were indulged in, bringing the splendid meeting to a happy close.

J. L. Erwin, of Fulton, in happy style spoke of the work and efforts of the Lebanon press. Nowhere he had been had he seen as much interest taken in the meetings by the local press, and he congratulated the Lebanon papers on their efforts in the interest of the farmer's work and the encouragement and aid given the State Board of Agriculture in their mission.

C. W. Murtfeldt, in addition to the report of the committee on resolutions, spoke of the warm welcome and magnificent hospitality extended by the citizens of Lebanon.

Ex-Gov. Colman said the meeting had been a grand success, the papers and discussions of a high standard of excellence, and he paid a high compliment to the local press for their part in the work.

J. C. Evans congratulated the farmers of Laclede county on the success of the meeting. He said Laclede county had a live society and one of the best in the State, of which the State Society was proud Southwest Missouri, he said, was the finest fruit country in the world, and he was glad to see the interest taken by our farmers in horticulture and agriculture.

The resolution favoring liberal appropriations for the work of the State Board of Agriculture was heartily indorsed in several speeches.

Levi Chubbuck, Secretary of the Board, complimented President Nelson on the success of the meeting, to whose efforts all praise is due. He has made the meeting the brilliant success it has been.

J. L. Erwin made a few timely remarks on the importance of legislation for better country roads, and favored a change of the present road laws to that end. His suggestions were heartily indorsed.

Gov. Colman said there was a general effort being made in that direction, and he thought the present Legislature would change the road laws.

On motion, the Laclede County Agricultural Society will meet on Saturday of this week to reorganize.

Levi Chubbuck suggested that the Laclede County Society elect a delegate to meet with the State Board of Agriculture and Dairymen of Missouri at a meeting to be held at Jefferson City the middle of this month, to perfect a permanent State organization.

Laclede county will elect a representative to this convention of farmers at Saturday's meeting.

Mr. Chubbuck, Secretary of the State Board, stated that all papers read during this meeting would be published in full in the proceedings of the State Board, and requested that the papers not in his possession be sent to him at Columbia, Mo., for that purpose.

Mr. Erwin, of Fulton, complimented the ladies on their attendance at the meetings and the interest taken by them. He thought much credit was due the ladies.

After a few well-chosen remarks by President Nelson, challenging for Laclede county a comparison with any county in the State in intelligence, progressiveness, resources and capability, the meeting adjourned.

THE BANQUET.

Tuesday night a grand banquet was given by the citizens of Lebanon and the Farmers' Institute of Laclede county to the State Board of Agriculture and visitors, at the palatial Gasconade hotel. It was a brilliant affair and a fitting close of a highly successful meeting of the farmers. Over one hundred guests were present, and the reception in the parlors of the hotel during the early part of the evening was most pleasant and enjoyable. The beauty and gallantry of Lebanon turned out to welcome the visitors. It was a brilliant gathering, and in addition to an elegant and magnificent banquet, was a "feast of reason and flow of soul."

One hundred and twenty-five persons were seated at the banquet table. Manager Shaw sustained his well-earned reputation, and the spread was a triumph of the culinary art. A beautiful and artistic menu card was presented to each guest.

MENU.

The elegant and delicious menu consisted of:

Oysters.
Raw. Escalloped. Stewed.
Olives. Celery.
Boned Turkey, aspic jelly.
Ballantine of Duck.
Romaine Punch.
Turkey. Ham. Tongue.
Chicken Salad Mayonaise.
Assorted Cake. Fruit. Mixed Nuts.
Raisins. Black Coffee.

After this grand repast came the "feast of reason and flow of soul," but space forbids even a synopsis of the bright oratorical efforts of the evening.

The following toasts were eloquently responded to: "Our Guests," by Hon. J. W. Farris; "State Board of Agriculture," Hon. Norman J. Colman, St. Louis; "State Horticultural Society," J. C. Evans, Harlem, Mo.; "The Benefits of the State Board of Agriculture," Dr. R. D. Shannon, of Lebanon; "To the Memory of Henry Shaw," James Gurney, St. Louis; "A City Man's Visit to the Country," G. W. Waters, Ralls county; "A Country Boy's Visit to the City," Judge Samuel Miller, Bluffton, Mo.

TO OUR GUESTS.

Hon. J. W. Farris of this city spoke as follows:

On behalf of our people I extend them a cordial greeting. On behalf of our city and county I extend them a cordial greeting. On behalf of the genial host who presides over this magnificent hotel, the classic Gasconade, and who prepared this splendid repast we have enjoyed, I extend them a cordial greeting. While I extend this greeting to this charming company, to one and all—ladies and gentlemen—I shall regard as our especial guests those who represent the State Board of Agriculture. Your visit, gentlemen, to our city, is one of duty, and a duty of the highest importance; and while you labor to make it possible for our tables to be laden with plenty, we tender you this social entertainment, that your pathways may be strewn with flowers.

From the time when the Almighty commanded Adam to "tend the ground and eat bread in the sweat of his face," agriculture has been an established branch of industry, and the science of agriculture is and has been to make the soil most productive and produce that which the people demand, so that the producer may receive the best possible compensation for his labor. This result is necessary, if indeed agriculture is to retain its divine assignment at the front of all industries. So long as the intelligent, cultured and governing classes of the people are engaged in agriculture, so long will the occupation be kept to the front, and greater strides will be made to advance and perfect it. Ancient Rome was at one time the greatest agricultural country—noted for its literature along this line and the many eminent men like Cincinnatus and Cato, who were leaders in agriculture; but in time the governing class forsook the farm and farm-life, and turned agriculture over to the inferior classes, and in Rome the noble profession became ignoble and the field and farm lost its charms for the ambitious and the enterprising.

In our own beloved country the contest has come, and the question now remains unsolved, but under consideration: shall the agriculturists continue to be the land owners and the governing class? or shall they be reduced to a condition of tenantry and be the serving class to the downfall and ruin of their profession? It is a matter of much encouragement to our agricultural class that so much is being done by the Federal and State Governments to sustain them. Our noble commonwealth honors its illustrious name and emblazons the pages of its history by commanding the time and talents of such of its citizens as our honored guests, in the effort to elevate the agricultural classes and to devise means and perfect methods to make agriculture remunerative and amply compensating to those engaged in it, and save it from the disaster which has befallen it in older countries. We reflect with pleasure that among these faithful workers in Missouri, and one of our guests this evening, is an illustrious citizen—the first to sit in a President's cabinet as the representative of agriculture. I refer to ex-Governor Colman, of the city of St. Louis. If the masses will hear and heed their advice and follow their admonitions and profit by ther experiments, the farmers of our times will continue to be the rulers. It is said that he who makes two blades of grass to grow where but one grew before, is a public benefactor; then our farmers are indeed public benefactors, for they strive each year to not only produce two blades where but one grew before, but enlarge their broad fields by adding acres to acres of meadow, orchard and fallow-fields, until under their dominion the desert blossoms as the rose.

In conclusion, I will say to our guests, that like the customs of all countries, our beverage is the beverage of the realm. If you were in Germany, you would be toasted with lager beer; in England, with ale; in France, with wine; in Kentucky, with its bourbon; but here upon the summit of the Ozarks, with nature's own beverage—pure magnetic water. So with a draught from nature's fountain, I drink you a toast, and in the language of Rip Van Winkle, say: "Here's to you and your good health; may you all live long and prosper."

NOTES.

The court-room was crowded at every session.

Ex-Gov. Colman said with emphasis, "It is the best meeting ever held in the State."

Lebanon has had two big meetings within two weeks—the teachers and the farmers—both brilliant successes.

G. W. Waters, of Ralls county, is a big farmer, and gave interesting views on different topics during the discussions.

J. W. Sawyer, of Chicago, took an active part in the meeting. He is authority on dairying, and an interesting speaker on all farm topics.

C. W. Murtfeldt, of St. Louis, Thos. Lafon, of Columbia, and Hon. N. J. Colman arrived, Monday afternoon and took leading part in the meeting.

Ex.-Gov. Colman said to the Rustic, "There is more enterprise in Lebanon and among the farmers of Laclede county than any place I have been in for some time."

Reference to the condition of the Laclede County Fair association was humiliating. Our farmers ought to be ashamed of its failure, and resolve to make it a success. It can be done. Farmers, take hold of it.

The fine display of apples, potatoes, corn, wheat, carrots, radishes, parsnips, squashes, pumpkins, celery and other magnificent products were contributed by A. Nelson, Judge McIlvaine, Dr. J. B. Atchley, G. M. Hamel, G. L. Walker, E. Divine, I. N. Newkirk and others.

The milk separator attracted much attention.

J. W. McKee, of Stoutland, was an interested spectator.

T. L. Case, the Rolla nurseryman, took much interest in the meetings.

President Nelson is entitled to all the praise and credit he is receiving on the grand success of the meeting.

The Rustic will publish next week the splendid essay read by M. W. Serl of this city. It is a very interesting paper.

C. Hanson and wife, of Conway, were present Tuesday. Mr. Hanson is considerable of a farmer and entered into the discussions.

Judge D. W. Beard, presiding judge of the county court, attended the meetings and took much interest in the proceedings.

During the noon hour Tuesday, Mr. Sawyer, of Chicago, gave an exhibition of his cream separator which was witnessed by a number of farmers.

Judge Burhans, of Stoutland, attended the meetings and occupied a front seat. The Judge probably knows more about agriculture than he does about politics.

A. C. Cavan attended every session and was a close listener to all the good things said. He furnished two gallons of milk from his fine Jerseys to see the cream separator tested.

Judge McIlvaine accompanies the State Board to Willard, Clinton and other places on their tour. He will read two excellent papers—his own, on "Clover," and "General Farm Topics," by Judge J. H. Fulbright.

Prof. James Gurney, of St. Louis, Superintendent of Shaw's garden, arrived Tuesday morning and was delighted with the meeting. He responded to the toast, "The Memory of Henry Shaw," at the banquet Tuesday night.

Fred King, editor of the Marshfield Standard, was among the visitors Tuesday, an interested spectator and attended the banquet. Bro. King, as editor and politician, by his interest in farmers' meetings at all times, cannot justly be accused of "farming for political purposes."

Jacob Blickensderfer, of Oakland, this county, is one of the greatest civil engineers of the country. He owns the largest and finest farm in Laclede county, and takes a deep interest in agriculture. He talks entertainingly on any farm topic.

Prof. J. J. Thomas, of Hoboken, New Jersey, an eminent geologist, who is investigating the resources of Missouri for investments by Eastern capitalists, arrived Tuesday noon from the west, and was an interested visitor during the remainder of the meeting, attending the banquet Tuesday night.

Judge J. H. Fulbright, of the Dry Glaize, member of the State Board of Agriculture, was unable to attend the meeting on account of sickness. He had prepared a paper on "The Needs of Agriculture and General Farm Topics," which was sent in and read. It was an able paper, and treated the subject in an interesting manner. The paper will be read at other meetings of the State Board.

VERNON COUNTY.

SHELDON, MO., Jan. 9, 1891.

At this as at other meetings, "Stock Feeding" was a topic of absorbing interest, and the paper of H. J. Waters was freely commented upon.

Mr. Erwin said the figures given in the paper did not tell all the story, for the profit made on the early gain in weight is absorbed by the later gain.

Major Hickman corroborated figures and paper from his own experience.

Mr. Hogan maintained that steers should be brought to a certain weight before being put on the market.

Mr. McCutchin said the profit on export cattle is largely on the weight of the carcass before beginning to feed for market.

Mr. Erwin brought out from this that one food is not so profitable as a mixture. If you have corn fodder, don't feed it alone and then feed clover hay, but feed the two together.

Q. Does flax straw make profitable feed?

Mr. Hogan: I had a rick of flax straw in my stock field, but my cattle did not eat it. I sold it to a neighbor who fed it to calves, which ate it up clean. This year stock in pasture have eaten it in preference to grass.

Mr. Jones: I had a few loads of flax straw which my cows and horse refused to eat, while calves ate it greedily and grew fat.

Think the reason the stock didn't eat the straw is they didn't know it was good; they have to be educated.

Mr. Simms: I would rather have the straw than prairie hay if fed alone, but I want something to feed with it.

Mr. Williams: I have fed with good results to cows with calf. It is a good laxative and there is no trouble in calving.

Ques. Do you find any trouble feeding flax straw to mares with foal?

Ans. None.

The serious loss the farmers had sustained in the death of their horses gave rise to a discussion on the causes of the death, and the opinion prevailed that it came from eating smut from corn.

AFTERNOON SESSION.

In answer to a question as to the profits on raising castor beans, Mr. Hogan said, in late years the price has not been so good as formerly, but the profit is fair directly, and greater in the improved condition of the land for corn.

For this crop plow the land early as possible, prepare well, and plant with a check rower as you do corn.

There is danger from the cut-worm, and when sprouts are cut off they are gone, for it is too late to re-plant. When the danger from the cut-worm is past, about two weeks after germination, thin to two stalks in a hill. The crop will ripen in August; the pods burst open and must be picked and saved. Pile up and protect from rain and dew, for if wet, the bean will readily sprout and spoil.

Mr. Jones: I have not realized much profit directly from this crop, but my land has steadily improved. My neighbor has for a number of years grown castor beans, and his crop has increased with each year. Last year his yield was twenty bushels per acre, giving a return of more than thirty dollars per acre. I think it best to continue the crop for a number of years, and get the crop off early, so as to get the long days of sunshine to dry and burst the pods.

Mr. Wyckoff: Most of us plant too deep. I would not use the planter, but mark off and drop the beans, covering with the foot lightly.

Ques.: If the beans are planted in rich soil, don't they grow too much to stalk?

Ans.: Land can't be too rich, and it must be rich to get a good yield.

J. L. Erwin lectured on dairying, and was followed by J. Y. Sawyer, who talked particularly of the different methods of setting and raising cream. He asserts that the use of the separator is the most satisfactory method. The difference in size of globules makes a difference in raising cream, excepting with a machine. Cream should be ripened before churning, and sweet and ripened cream should not be mixed under twelve hours before churning. Use churns without inside fixtures.

Ques.: What about putting ice in churn?

Ans.: Don't like to use ice at all, but if it must be put in churn, do so before starting to churn. Its use is apt to make the butter white and destroy the flavor.

Samuel Miller talked horticulture in its relation to the health and wants of man. Every man should grow fruit, and every man can grow grapes on the south side of his house where the eaves will protect them; the vines will not make the house damp. The Ben Davis is the apple for a commercial orchard. The Jeniton is a good keeper, but the Newtown Pippin is better. The Clayton, Minkler and Missouri are also good.

The jay-bird should not be shot, for it is the enemy of bugs which cut the grapes. The Empire and the Diamond grape are the best two to plant for either market or home. The Captain Jack and Cumberland strawberries, originated by me, are still nearly, if not quite, as good as any.

The Weaver, DeSoto and the Damson plums are the best. Don't leave trees too full of fruit; thin by jarring the trees. Prune any time from the falling of the leaves until they start again in spring.

After pruning, give surface of cut a coat of shellac or linseed oil to protect.

Mr. McIlvaine talked on "Fertility of Soil," and clover as a means to that end.

To complete the program, the session was continued without supper, and adjourned at 8:30 o'clock.

ST. CLAIR COUNTY.

APPLETON CITY, MO., January 9.

Owing to a change in time on railroads of which the Board and corps of assistants were not aware, the attendance of Board representatives at this meeting was light, but that the farmers and dairymen of the section are thoroughly alive to the importance of the work being done by these Institutes was patent from the attendance, notwithstanding the severe weather, of farmers from a distance of twenty five miles.

An excellent local program was carried out, and the subjects of "Horticulture," "Stock Feeding" and the "Trotting Horse" were handled by Major J. C. Evans, G. W. Waters and Thomas Lafon, representing the Board of Agriculture.

The Board is under obligations to the editor of the Appleton City Journal, and other citizens of Appleton and the county, whose efforts contributed to the success of the Institute, and for their generous hospitality to the members attending.

HENRY COUNTY.

From the Henry County (Mo.) Democrat.]

CLINTON, MO., January 10, 1891.

As advertised, the State Board of Agriculture met at the circuit court-room, this (Saturday) morning at 9:30.

Major Thos. Day was called on to preside, and Levi Chubbuck, Secretary of the State Board, was made secretary.

The proceedings were opened with an impressive prayer by Rev. Bernard.

Rev. W. P. Armstrong then welcomed the guests in a very neat speech.

In the absence of Vice-President Smith, Mr. Chubbuck made a fitting response.

On account of having a call to leave the city, Rev. W. P. Armstrong was accorded the courtesy by Mr. Taylor of his place on the program, and read an able address on "Agriculture in the Public School," as resources of enlightenment necessary to bring the mass of the coming classes of agriculturists up to a standard that will enable them to be as intelligent and prosperous in their business as other pursuits of life.

The program is quite interesting, and is being listened to by a number of home people as well as visitors.

J. C. Evans, of Clay county, President of the State Horticultural Society, read a very fine paper on "Horticulture." Speaking of apples, he said success was quite dependent on location and soil, and from his somewhat extended knowledge of Henry county, its soil is quite well adapted to fruit-growing. He summed up the best treatment of an apple orchard into thorough cultivation. This must continue as long as one wants to get a crop of apples. He believed in giving the highest culture possible, and getting the most out of the orchard in the shortest time, and when the trees are exhausted, he would cut them out and plant a new orchard. He would use any tool or implement that would keep the soil in a well pulverized condition. Thorough cultivation will keep the borers out of the trees.

Samuel Miller, of Montgomery county, continued the subject of Horticulture. He advised thinning fruit when set thick; that the maturing of the seed is the heaviest tax on the tree, and wanted the smallest number of specimens that would give the largest measure of fruit. He advised planting the dwarf Duchess, and for standard, the

Kiefer. Curculios could be overcome by smoking plum trees with mouldy hay. He thought this means would be effective in driving off the codling moth, and probably destroy grape rot.

G. W. Waters, of Ralls county, discussed the subject of "Conservation of Soil Fertility."

The next speaker was J. L. Erwin, of Callaway county, on "Dairying." He remarked first that ninety-nine out of every one hundred Missouri farmers were land poor, and strongly advised a reduction of the number of acres, and an increase in the productive capacity of what was left. This, he claimed, would best be accomplished through dairying, as affording a large amount of manure. Success in dairying is dependent on observing small things. Cows must be well selected and well bred, well sheltered and carefully handled. He had increased the yield of butter per year nearly one hundred pounds since he first engaged in business.

J. Y. Sawyer, of Chicago, exhibited and operated the Babcock milk tester—testing four samples of milk. The following results were obtained:

No. 1 yield showed 3 per cent. of butter-fat; No. 2, 3.6 percent; No. 3, 7 per cent; No. 4, 5.6 per cent.

. The next paper was by Maj. Thos. Day, of Lewis Station, this county, on "Legislation Pertinent to the Board of Agriculture," in which he argued for increased facilities for carrying on the work of the Board, and with more means with which to hold Farmer's Institutes.

Mr. John Taylor, of Fields Creek township, this county, read a historical paper on "Cereals," giving their history, so far as they can be traced.

The Institute adjourned to meet at night.

NIGHT SESSION.

The night attendance was not as large as the day sessions, but there was much interest manifested, and the papers read and discussions were quite animated.

Secretary Chubbuck opened the exercises with introductory remarks, saying the State Board of Agriculture was hampered for the want of sufficient funds to fully prosecute their work and carry out their manifold purposes for the interest of farmers. If the Legislature would give them a suitable appropriation, among other things they would have their monthly crop reports circulated through leading country newspapers as supplemental sheets.

The next speaker said one part of a farmer's education was to learn a systematic plan for breeding cattle. This county, so far as he was able to see, had the soil and water, and surely the remainder rested with the farmer. Our horses compare favorably with the best Kentucky stock.

Mr. Thomas Lafon, of Boone county, read an excellent paper in which the horse was discussed. He believed the farmer's horse will come from the trotting breed, and pictured the ideal horse at a height of 16 hands and a weight of 1,200 pounds.

Mr. McIlvaine, of Laclede county, discussed clover and its relations to agriculture. All clover should be tested, and probably a variety could be found for more general utility than the kind now used. In many instances clover seed was adulterated, and in Bohemia it was mixed with a colored, fine pulverized quartz. The objection to winter-killing could be removed in a great measure by not cutting too close and pasturing so late.

In reply to a question from Mr. Kistler, the speaker said clover seed were kidney-shaped and glossy. Plantain seed were flat, and could be detected when mixed.

Mr. Evans said mammoth clover was valuable on clay soil.

Col. McLaine was called to the chair, when Mr. H. T. Burris offered the following resolution, which was unanimously adopted:

Resolved, that the present Legislature be asked to appropriate the sum of $12,000 for the maintenance and support of the Institute work of the State Board of Agriculture.

The Henry County Democrat was requested to embody the resolution in its report, and forward a marked copy of the same to our Representative, W. H. Davis, and Senator J. N. Bradley.

W. M. Goodwin presented a resolution as follows:

By the farmers of Henry county, in Institute assembled, be it

Resolved, that the General Assembly of the State be and is hereby recommended to appropriate an adequate sum, at least one hundred thousand dollars, for the purpose of making a display of the agricultural importance of the State at the World's fair at Chicago.

Unanimously adopted.

Mr. Homer T. Burris, farmer and dairyman about four miles east of Clinton, read a most excellent paper, "The All-Purpose Cow."

Mr. Erwin brought forward the question of good farm roads, and said it would help farmers more than probably any one thing now before them, and was the panacea for our many troubles. In Callaway county, his home, the farmers' method of securing gravel roads was to make neighborhood organizations of interested farmers and assess themselves $1 per acre for the first half mile on each side of the road-bed, then 50 cents per acre for lands beyond this limit. Prisoners serving jail sentences were used on this work. He said a bill would be presented to the sitting Legislature allowing convict labor to be leased to road working parties at seasons when they could be adequately guarded.

Mr. McIlvaine said he believed it cost many farmers of this county, in wear and tear of team and wagon, and time, as much to haul their wheat to town market as it did to ship from town to Kansas City.

The Institute then adjourned.

CASS COUNTY.

Reported by the Leader.]

BELTON, MO., January 12, 1891.

The State Board of Agriculture held one of its highly interesting sessions here Monday. Garnett's hall was packed to overflowing with the farmers of Cass and Jackson—their wives and daughters. The signal success of the meeting, which the Board assured the committee was one of the best one ever held in the State, was largely due to the unusual and intelligent interest manifested by the farmers.

MORNING SESSION.

H. D. Seymour was elected permanent chairman, and called the meeting to order. After a few well chosen words of welcome to the visitors of the occasion, he introduced Levi Chubbuck, Secretary of the State Board of Agriculture, who responded to the greeting in a most happy and felicitous manner, and explained the object and purpose of the meeting. Mr. Chubbuck gave an interesting description of the Board, its aim and intention and the material advantage to be derived from it. He also read a paper, on the subject of

LIVE STOCK AND FEEDING.

The speaker said no good results were obtainable from either cutting or steaming grain, and that no advantage was gained in grinding grain. He thought that silos gave a profit in dairying, and that shelter was indispensable, to secure the best results. His remarks on

THE AGE TO FATTEN,

were of peculiar interest to our farmers, from the fact that this is a stock-feeding locality, that shipped 234 cars of fat stock from this point last year. The record of the experiment station, as shown by Mr. Chubbuck, gave a maximum age of 30 months for cattle and 10 months for hogs as the best to fatten.

Adjourned until 1 o'clock.

AFTERNOON SESSION.

The session was opened with a song by Belton Glee Club. Dr. H. B. Adair, a distinguished veterinary surgeon of Kansas City, read a paper on the germ theory in Texas fever and its prevention by inoculation. It was an excellent and interesting treatise on the subject. Dr. Adair thought that Texas cattle would not breed or propagate the germ of the fever if they were driven slowly to the north, grazing as they came, instead of being brought direct by railway. He maintained that the safest preventive of the fever was to prevent contact with southern cattle or the lands upon which they had grazed within fifty days. Cattle brought from where the prairie dog thrives do not give the fever. Questions were asked on the

INOCULATION OF SWINE.

Dr. Adair did not think the experiment advisable. He said it transferred the disease in its primary form to the healthy animal. Giving the symptoms of diseases in hogs, he said, hog cholera attacks the alimentary tract, and hog plague, the lungs. Hogs that cough have the plague. N. E. Harrelson suggested that the fatal disease prevalent this year arose from poisonous worms in the corn. Mr. O. B. Green had fed his hogs on pumpkins and mangel-wurtzels and had stopped the progress of the disease among them. He had grown 520 bushels of beets on a quarter acre, some of which weighed 25 pounds. Dr. Adair said the best preventive of the hog disease was to keep the herd away from other hogs, impure water, and the pens where infected animals have been kept. Experiments to secure properly attenuated inoculative matter had not been made.

HORTICULTURE.

L. A. Goodman, Secretary State Horticultural Society, Westport, Mo., made the next address. His subject, he said, was the poetry of agriculture; and to give the best results should be made a specialty. New virgin soil, or any good corn land, was the best for fruit-growing. Prunes, pears, peaches, apples, grapes, should be set plentifully, and cared for assiduously. Don't be afraid you will get too many fruit trees, said he. Two hundred acres would not be too much. Missouri had the best fruit lands on the continent, and the best market, not excepting the sunny slopes of California. Southern Illinois had shipped from ten to fifteen cars of strawberries each morning in their season over the Illinois Central to Chicago, and found a ready and remunerative sale, yet Missouri soil was better adapted to their growth, and the market was at our doors.

Judicious, energetic, systematic apple growing was clearly a lucrative industry. New land was best for trees. Prepare the land by plowing in the fall, then replow in the spring. Mark the ground with plow, both ways; make no large holes. Select one and two-year-old trees. Don't cut out the straight center shoot. Put wire screen around the tree. Pack the dirt well about the roots. Don't butcher the trees. As soon as the trees begin to bear, don't crop any more. Be careful in the cultivation; better bark shins than trees.

Plant large orchards so that certain localities become noted as fruit centers. Large quantities sell better than small. Go at it like any other business. Don't let rabbits eat up the trees. Plead for and practice business methods in fruit culture.

Best commercial apples, Ben Davis, Willow Twig, Rome Beauty, Winesap. The market demands large apples of pronounced color.

High lands and northern slopes afford the best location for an orchard. Corn is the best crop to grow in orchards. Don't grow anything after the trees begin to bear. Cultivate the same as corn, plowing both ways; don't throw the ground into hills or rows around the trees. Orchards fail because of the exhausted fertility. Manure will help, but cultivation is better than anything. The worst thing for an orchard is grass. Don't mulch, it causes the roots to come too near the surface. Trees should never be wrapped or boxed; those practices cause the bark to become too thin and tender to withstand hot suns or cold winters. Wire screen is the best protection against rabbits or borers. Set wire two inches in the ground. It pays better to grow fruit than anything.

N. E. Harrelson questioned Mr. Goodman in regard to chestnut culture, and elicited the information that he had an orchard of 150 thrifty trees, that had been bearing for the last five years. The speaker's remarks were highly appreciated. The enthusiasm he feels for his chosen vocation was transmitted to his audience. Therein lies the noblest use of personality.

J. L. Erwin, of Callaway county, one of the most prominent dairymen in the United States, next addressed the meeting. Mr. Erwin felt embarrassed because of the sumptuous banquet to which he had paid such excellent compliment in a material way; and because of the statement of his friend, Judge McIlvaine, that he was expected to present, in fitting phraseology, the thanks of the Board of Agriculture to the ladies of Belton for their gracious ministry to the comfort of the visitors. He felt unequal to the occasion, but was sincerely gratified at the courtesy bestowed.

Mr. Erwin opened the subject in hand by saying: "This is the age of specialties." Special lines of business, he thought, paid best. Farming and dairying naturally went together, because cows must be fed, and feed must be grown on the farm. Then again the land must be fed with fertilizing agents, and cattle produced that agent in abundance. He suggested that perhaps our farms were too rich to need manure, and said the number and size of the corn shocks showed this country to be a dairying country, because rich in corn fodder, the cow's best food. He observed that there was no limit to fertility, and therefore it paid to follow the line of business that increased the fertility of the farm rather than that which impoverished it.

He had kept an account of his farm operations, and invariably found that the cow paid better than corn or wheat, cattle or pigs. He said: "There must, however, be adaptation for the work of dairying. Whoever goes into the business must be peculiarly fitted to carry out small details. The cow must be milked. The cow must be fed, so should every animal on the farm. The individual must love the cow, and treat her like a lover. Don't take the stool to the cow, she never forgets or forgives an injury. Keep quiet in the barn. No stool music while milking. Shelter is indispensable to success. Sheltered calves double their weight in winter. Shelter saves time and food. Pure food is an absolute necessity for good milk. Upland grass is best for dairying. Impure water causes impure milk, and impure milk causes disease. Premium butter can't be made out of pond water. Cows love good, pure, cool water. Their instinctive dislike of all impurity should be respected. Be good and kind to dumb animals. There is no good in cooked, cut or wet food. Dry, uncrushed or unground food is the best for all animals. The object in farming is to get ration for stock. Clover and corn are of prolific growth and better than shipstuff.

Kansas City has ruined the all-purpose cow. She is no longer salable at the shambles. Avoid heavy weight in milkers. A 750 pound cow is better than a 1,200 pounder. It takes less food to get more milk out of the smaller cow than the larger one. Let beef cattle not be chosen for milkers. Blue-grass makes feathers or bristles, just as geese or hogs feed upon it. The standard of milk in Kansas City is 3 per cent. That of St. Louis is 2½ per cent. There is no difference in winter or summer milk. Change in the animal only changes the flow. Milk with dry hands, trim the finger nails closely. The pump is better than the pond. Dehorn your cows. The grade Short-horn is a good cow, but the Jersey is better. The finest flavored milk and butter in the Union is made in Missouri. There is no cure for garget, but it may be prevented by care. Corn and clover hay are the best feed. Oil-cake meal is also good. Half a feed of ensilage and the other half clover hay does well. Oats are good feed when they don't cost too much. The feeding of ensilage does not give color to milk.

The Short-horn is the best general purpose cow. The Holstein is the next best. The Ayrshire is the best milker and the Jersey is the best butter cow.

Mr. Erwin commanded the attention of his audience throught his discourse, and can safely comfort himself with the reflection that he will be remembered and honored in Belton as long as the present generation survives.

J. Y. Sawyer, of Chicago, an authority on dairying, read an interesting paper on that subject, and explained the opinions of the milk tester, of which he gave an exhibition. The experiments were interesting and instructive.

While the band discoursed sweet music the people dispersed, and thus ended the most momentous occasion that ever occurred in Belton, and the most successful agricultural meeting ever held in this State.

PETTIS COUNTY.

LA MONTE, MO., January 13, 1891.

Judge White called the meeting to order and A. J. Hall was chosen to preside. After briefly stating the purposes of the meeting, the chairman introduced ex-Lieutenant-Governor Norman J. Colman, who spoke more fully of the Board of Agriculture and its work.

Mr. G. W. Waters followed with a paper on "Stock Feeding," which was freely discussed.

Prof. Kirk excepted to the cutting of feed for cows.

J. S. Fleming stated that he had found it advantageous to grind feed for two-year-old steers on account of a shedding of teeth. He had put on as much weight in three months on ground food as in five with unground. He thought it more profitable to grind the corn fed, than to feed whole and have pigs to follow the cattle.

Judge Samuel Miller addressed the audience at the opening of the afternoon session on "Horticulture."

Gov. Colman followed with an address on "The Horse." In comparison with Kentucky, the speaker said Missouri was the State for horse-raising.

J. L. Erwin discussed "Dairying as a Means of Improving the Farm."

Prof. Kirk and others questioned the statement that rich food did not materially increase the per cent of butter-fat in the milk.

J. Y. Sawyer talked of the quality of milk and analyzed some samples, using for the purpose a Babcock tester, manufactured by D. H. Roe & Co., Chicago.

The evening session was opened with a song, "The Farmer Feeds Us All."

Prof. Kirk read a paper on "Horticulture." The American farmer is fast becoming a specialist. He must be, if large crops are to be raised, and only such will pay. He would not have more than seven varieties of apples in the largest orchard, family or commercial. The Maiden's Blush and Lowell were named as good varieties; Jonathan is a good apple, but must be picked early and shipped north; Ben Davis is the money-maker; Winesap is good, but the tree is not a strong grower; Rome Beauty is a shy bearer.

Plum trees should be well manured from the chip-yard, particularly the Damson.

Strawberries are not as abundant as they should be. They should be grown on strong land; plant two and one half feet each way; cultivate well.

Of raspberries, the Tyler, Early Ohio, Hopkins and Gregg were named of the black-caps, and Turner of the reds.

The Snyder blackberry was regarded as the best and freest from rust.

Mrs. Geo. E. Dugan, of Sedalia, read a paper on "How to Keep the Boys on the Farm."

After a song, "The Old House at Home," Gov. Colman was again called to the stand for a few closing remarks.

A motion that the Board of Agriculture be invited to hold another meeting at La Monte one year hence was unanimously adopted.

MONITEAU COUNTY.

TIPTON, MO., Jan. 14, 1891.

The Farmers' meeting at Tipton was organized by electing W. S. Howard Chairman and H. L. Barrick Secretary. Prayer was offered by Rev. Wilson Asdale. O. K. Brown made an address of welcome, to which Abiel Leonard, Vice-President of the Board of Agriculture, responded.

Judge W. R. McIlvaine, of Laclede county, presented a paper on "Clover."

Major J. C. Evans, of Clay county, in the discussion following the reading of the paper, explained that the reason why clover helps to improve land is that it gets considerable of its food from the air, more so than did other plants.

Mr. G. W. Waters, of Ralls county, said that clover has a feeding value not fully brought out in the paper.

Abiel Leonard, member of the Board from Saline county, asked which will be best for the land, to sow clover on wheat in the spring, take one crop off the next season and plow under, or to let the clover stand longer?

Judge McIlvaine thought the land would be benefited more by plowing the clover under, after taking off one crop of hay, than by letting it remain longer.

Mr. Geo. Harned, of Cooper county, read a paper on "Stock Breeding."

Mr. Waters asked, would you favor general purpose cattle?

Ans.: No; not in this State. We should raise cattle for beef that have been bred for beef.

A. J. Moser presented a paper on "Public Roads." In the discussion following, Mr. Waters asked as to the value of tile in road construction.

Mr. J. L. Erwin, of Callaway county, said he had had experience in the use of tile. It is of no value on the road-side on slopes, but laid in the center, it is most effective in making a good road-bed. It is the water that comes up from below that makes a road-bed spongey and muddy.

Mr. Harned thought there was no need of tile in a rolling country, only when there are wet weather spings. How we are to get road-beds thrown up, is the question. Available funds are limited. He thought working roads ought to be a business like farming or anything else.

Any man of ordinary intelligence can do good work if he gives his mind to it. He said we did not get ten per cent of the value of the road tax expended on roads.

Mr. J. L. Erwin was next introduced for a lecture on "Dairying." He prefaced his remarks with a few words on the subject of roads, emphasizing all that had been said regarding their importance.

Ques.: How do you treat a cow just after calving?

Ans.: I feed lightly for a few days before and after calving; do not feed corn; keep the cow warm and comfortable.

Ques.: What is the best butter food?

Ans.: Am trying to make a combination of corn and clover. Am trying to produce my own food, so as to be independent of the millers. He advised winter dairying.

NIGHT SESSION.

P. J. Weber, a young nurseryman of Tipton, read a paper on "Horticulture," which was highly complimented by Major Evans, Judge Miller and others.

Mrs. Geo. E. Dugan, of Sedalia, well known to the farmers of the State through the columns of the Rural World, presented a paper entitled "The Two Ways," which was very favorably received by the audience.

Prof. W. A. Clark, of the Tipton schools, presented a well-written paper on "Education."

Dr. T. E. White, Deputy State Veterinarian, of Sedalia, being called upon for a talk, referred to Mr. Erwin's statement regarding impure milk as a source of disease, and cited a number of cases of disease traceable to that source. He urged the importance of guarding against impure milk. The use of sterilized milk as food for young children would prevent much sickness and death. Typhoid fever is caused most often by drinking impure water. This can be made wholesome by boiling. The doctor asserted that medical science was being developed through the investigations of the veterinarians.

Mr. Geo. W. Waters, of Ralls county, talked about the "Soil." This being the source of all our living, it is a subject worthy of careful consideration by the farmer, and one on which there is much to be learned.

In the discussion following the address, Mr. Chas. E. Leonard remarked that second crop clover was worthless with him for food.

Major Evans said it was good for cows and calves, but should never be fed to *horses*.

JEFFERSON CITY.

January 15, 1891.

By mutual arrangement, the Board of Agriculture held its closing institute jointly with the first annual meeting of the State Dairymen's Association at the State capital. The business of the Association occupied the time of the members during the forenoons and afternoons of January 15 and 16, while the Board of Agriculture held sessions of the Institute at night in Representatives' hall. A report of the dairy meeting by the Secretary of the Association, J. M. Smith, is presented elsewhere in this volume.

Dr. I. N. Abraham, representative from Cass county, presided as chairman during the first session of the Farmers' Institute. A large audience, comprising many members of the General Assembly, were present, when the chairman introduced Prof. F. E. Nipher, of Washington University, St. Louis, as the first speaker of the evening. Prof. Nipher's address was on "A State Weather Service." The speaker established the Missouri weather service and conducted it for thirteen years, until it was transferred to the Board of Agriculture. He advocated an appropriation by the State to the Board of Agriculture for maintaining the service.

Representative Via, of Phelps county, inquired as to the amount needed.

Prof. Nipher answered that $1,500 a year would be sufficient to begin with, but more would be needed as the people came to appreciate the benefits coming from a well-sustained service, and the work was extended.

Representative Kurtz, of Boone county, asked if other states were maintaining weather service.

Ans.: Yes, thirty different states have a weather service organized, and the amounts appropriated for their maintenance ranges from $1,000 to $5,000 annually.

Mr. J. L. Erwin spoke at some length regarding the practical benefit the State weather service is to the farmers of the State.

SECOND SESSION.

January 16, 1891.

Hon. W. H. Hickman, representative from Daviess county, presided as chairman.

Hon. Norman J. Colman was the first speaker. By his long service (30 years), as a member of the Board of Agriculture Gov. Colman is well qualified to speak of the purposes and work of the Board. This work, he said, was to advance the agricultural interests of the State. He was just returning from attending a series of farmers' institutes held by the Board for this purpose. Many had not yet learned how these institutes were conducted. The Board held them at different points in the State where a desire to learn about better methods was manifested. Experts in the different lines of farming were asked to attend the meetings and talk with the farmers about better methods of cultivation, feeding, fruit-raising, dairying and other lines. Good seed was thus sown which would result in better crops, better stock and larger profits. The importance of this line of work was more fully recognized in Wisconsin, Illinois, New York and Massachusetts, in which states $10,000 a year was spent in holding institutes.

Referring to a recent statement in the papers to the effect that the members had a good time cavorting over the State, Gov. Colman said he had been doing some of the cavorting and knew how it was. To attend the meetings as they had to be attended meant loss of sleep and injury to health and no pay. The Board ought to be supplied with funds with which to employ speakers for the work. Such work must be done or our lands would soon become exhausted, like thousands of acres in the Eastern states, which, though once flowing with milk and honey, were now almost barren wastes. They had become so through the wasteful system of farming. Land in Virginia, which once produced great crops, can now be bought for one, two and three dollars per acre. We have a grand State; it is not "Poor Old Missouri," but Grand Missouri—let us try to keep her so.

The duties of the Secretary of the Board of Agriculture are continuous and arduous. He has to gather crop statistics and issue monthly and weekly crop bulletins, for the information of farmers, so they need not be the prey of the speculators, and an annual report, hold Farmers' Institutes, and much other work besides.

The farmers of Missouri have got to do something to vary the products of the farm. We are sending much of the fertility of our farms to Europe in the cotton seed and grains we export. Sir J. B. Lawes, the great English agricultural experimenter, had told him that the English farmers got pay twice for the cotton-seed meal and linseed cake they imported from America, once in the growth of the stock fed, and again in the manure made. Said he: "Why will you send so much of your soil fertility to England?" If this process continues, what will be the result 100 years from now? We must do something to keep up the fertility of our land. Mr. Erwin had told of one way to do this—by dairying. This has a formidable enemy in oleomargarine. This is sold extensively in Europe, where the stamp of the United States is regarded as a mark of its purity.

He thought there had been too rapid development of creameries in some portions of the country. There is no money in dairying, unless one is well fixed for the business and follows it intelligently. He considered horse-raising a safe and more profitable business. Not all should go to raising horses, but many can with profit.

Mr. Allen Clark, of Franklin county, presented a paper on "Roads," in which he advocated the construction of a system of State roads by the use of convict labor.

After the discussion following the paper, the meeting was adjourned, thus closing the ninth annual series, and the most successful ever held by the Missouri State Board of Agriculture.

LEVI CHUBBUCK, Secretary.

REPORTS OF COUNTY FAIR ASSOCIATIONS.

By the following extract from the State laws bearing on the State Board of Agriculture and the county agricultural and mechanical Societies, it will be seen that annual reports are required from the Societies for publication in the annual report of the Board :

SEC. 333. *Directors to report at each annual meeting—copy of report to be transmitted to State Board of Agriculture.*—At each annual meeting of the society, the board of directors shall report, in writing, the number of members and the financial condition of their society; the quantity and character of property owned by it, and the quality and cost of improvement of the same; the number and value of premiums awarded at their annual fair; the number and character of the animals and articles exhibited; a statement of the probable quantity of the staple commodities of the county, and the prices current thereof, and such other information in relation to the agricultural and mechanical interests of the county as they may deem worthy of general notice; and a copy of the reports so made shall be transmitted to the Missouri State Board of Agriculture, to be disposed of as provided in the next succeeding section.

SEC. 334. *State Board to report to General Assembly.*—The Missouri State Board of Agriculture shall, at each session of the General Assembly of the State of Missouri, report faithfully all the facts, statistics and information contained in the reports transmitted to them from the county agricultural and mechanical societies organized and incorporated under the provisions of this article, and such other facts, statistics and information as they may gather from other counties in this state in regard to agricultural, mechanical and domestic manufactures and productions, and to the raising of the various breeds of stock.

ADAIR COUNTY.

October 30, 1890.

Secretary State Board of Agriculture, Columbia,:

SIR—I herewith submit report of the Adair Co. A. & M. Association, for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	71	
Indebtedness	$3,000	
ASSETS.		
Land, number of acres 30, value		3,000
Buildings—		
Amphetheater		1,500
Horticultural hall		700
Mechanical hall		500
Stalls		1,200
General condition of property all new and in good condition.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Standard, number		3
Draft		93
Roadsters		27
Cattle—		
Durham, number		11
Holstein		11
Jersey		8
Polled		6
Hereford		13
Hogs—		
Poland China, number		13
Berkshire		1
Chester White		4
Sheep—		
Fine wool, number		3
Long wool		3
Medium wool		7
Poultry—		
Brahma, number		12
Cochins		12
Plymouth Rocks		4
Wyandotte		5
Leghorn		10
Turkeys		5
Ducks		10
Geese		3
Farm and garden products, number of entries		125
Miscellaneous		331
Total number of entries		720
Total number of premiums paid		400
Total amount of premiums paid	$1,064 50	
Expenses other than for premiums	520 00	
Total receipts	3,119 85	

JOHN CASKEY, President.

C. E. DARROW, Secretary.

ATCHISON COUNTY.

February 20, 1891.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Atchison County Agricultural and Mechanical Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	100	
Indebtedness	$1,800	
ASSETS.		
Land, number of acres, 55, value		$4,500
Buildings—		
Floral and horticultural hall		800
Amphitheater		750
60 box-stalls		1,200
60 open stalls		600
Hog and sheep pens		200
Other improvements		600
Total		$8,650
General condition of property, good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Thoroughbred, number		8
Roadster		32
Draft		10
For all purposes		24
Cattle, breed—		
Short-horn and Hereford		25
Grade cattle		4
Sweepstakes		13
Hogs, breed—		
Poland China		67
Sweepstakes		17
Berkshire		8
Jersey Red		11
Sheep, breed—		
American merino		4
Delaine merino		6
Sweepstakes		4
Crosses, any breed		4
Poultry, breed—		
Brahma		8
Buff Cochin		6
Dorkings		12
French fowls		14
Guineas		4
Turkeys		16
Ducks		20
Geese		10
Farm and garden products, number of entries		378
Farm implements, " "		6
Miscellaneous, " "		52
Total number of premiums paid		385
Total amount of premiums paid	$2,209 00	
Expenses other than for premiums	750 00	
Total receipts	3,276 35	

W. J. BUNTING, Secretary. JOHN P. LEWIS, President.

BARTON COUNTY.

LAMAR, Mo., Oct. 20, 1890.

Secretary State Board of Agriculture, Coulmbia:

SIR—I herewith submit report of the Barton County Stock and Agricultural Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	27	
Indebtedness	$2,750	
ASSETS.		
Land, number of acres, 25, value		$5,000
Buildings—		
Grand stand, value		1,500
Floral hall		1,500
Office		300
Stalls and pens		1,200
Other improvements, fence, etc		500
General condition of property, good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Speed ring, number		36
For all work		20
Roadsters		19
Draft		19
Thoroughbred and sweepstakes		23
Mules and asses		12
Cattle		15
Hogs, all breeds		14
Sheep		2
Poultry		18
Farm and garden products, number of entries		35
Farm implements " "		7
Miscellaneous " "		210
Total number of entries		430
Total number of premiums paid		235
Total amount of premiums paid	$901 50	
Expenses other than for premiums	716 70	
Total receipts	1,696 00	

REMARKS.—We had rain every day of our fair, which made it almost a failure.

WALTER J. MILLER, Secretary. C. H. BROWN, President.

CALDWELL COUNTY.

HAMILTON, October 20, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Hamilton District fair, for the year 1890, as required by section 333 of the Missouri Statutes:

Number of directors	13	
Indebtedness, none (out of debt and money in treasury).		
ASSETS.		
Land, number of acres		40
Buildings		3
Horse stalls		90
Cattle stalls		60
Hog and sheep		30
Other improvements, ampitheater.		
Other property, judges' stand and fish pond.		
General condition of property, good.		

EXHIBITS OF YEAR 1890.

Horses, breed—		
All purpose, number		72
Thoroughbred		6
Roadster		43
Norman		8
Grade draft		57
Clydesdale		4
Cattle—		
Holstein		1
Jersey		9
Short-horn		10
Hereford		6
Hogs—		
Berkshire		11
Poland China		32
Chester White		4
Sheep—		
Fine wool		33
Middle wool		14
Long wool		13
Poultry		11
Farm and garden products		650
Implements		12
Miscellaneous		92
Total number of entries		1,059
Total number of premiums paid		425
Total amount of premiums paid	$3,113 45	
Expenses other than for premiums	1,140 08	
Total receipts	4,597 25	

REMARKS—Our association is an assured success, has been from the beginning. The surplus is always expended in improving and beautifying the grounds.

A. C. MENEFEE, Secretary. JOE ANDERSON, President.

CALLAWAY COUNTY.

October 31, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Callaway County A. and M. Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	100	
Indebtedness	$3,200	
ASSETS.		
Land, number of acres, 40, value		$4,000
Buildings		12,000
General condition of property good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Saddle, harness and draft		250
Cattle, breed—		
All kinds		100
Hogs		75
Sheep		100
Poultry (a good display).		
Miscellaneous (good display).		
Total amount of premiums paid	$8,000	

REMARKS—We had a good fair and paid $1,400 on our debt.

ELWOOD TUTTLE, Secretary. J. S. WATSON, President.

CAPE GIRARDEAU COUNTY.

CAPE GIRARDEAU, November 17, 1890.

Secretary State Board of Agriculture, Columbia:

Sir—I herewith submit report of the Southeastern District Agricultural Society for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	296	
Indebtedness	$14,440	
ASSETS.		
Land, number of acres, 34¼, value		$4,000
Buildings—		
Amphitheater		4,000
Floral hall and machine shed		1,200
Ladies' cottage		800
Hog, sheep and chicken stables		200
Feed house		75
Other improvements, 225 stalls		1,200
Other property, ½ mile track, good.		
General condition of property very good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Stallions, number of entries		25
Mares		53
Mules		26
Geldings		46
Jacks and jennets		14
Cattle—		
Bulls		18
Cows		21
Heifers		11
Hogs—		
Boars		12
Sows		5
Sows with pigs		22
Porkers		32
Sheep—		
Rams		5
Ewes		12
Flock sheep		1
Poultry—		
Chickens		54
Turkeys		2
Ducks		5
Geese		2
Farm and garden products, number of entries		199
Implements		13
Miscellaneous		45
Total number of entries		1,439
Total number of premiums paid		486
Total amount of premiums paid	$1,362 25	
Expenses other than for premiums	1,204 24	
Total receipts	2,998 00	

E. H. EAGELMANN, Secretary.

F. A. KAYE, President.

CARROLL COUNTY.

Carrollton, Mo., Nov. 19, 1890.

Secretary State Board of Agriculture, Columbia.

Sir—I herewith submit report of the Carroll County Fair Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	10	
Indebtedness, none.		
Assets.		
Land, number of acres 38, value		$4,000
Buildings—		
Amphitheater		1,000
Floral hall		1,000
Dwelling		500
Barn		200
Other improvements		500
General condition of property fair.		
Exhibits of Year 1890.		
Horses, breed—		
Draft stallions, number		14
Farm stallions		21
Roadster		16
Saddle		2
Cattle—		
Short-horn		10
Angus		14
Hogs—		
Berkshire		8
Poland China		27
White hogs		18
Sheep and poultry, but few in number.		
Farm and garden products, number of entries		100
Implements		20
Miscellaneous		200
Total number of entries		520
Total number of premiums paid		285
Total amount of premiums paid	$2,680	
Expenses other than for premiums	600	
Total receipts	3,264	

Bedford Hudson, Secretary. F. J. White, President.

CHARITON COUNTY.

KEYTESVILLE, Oct. 23, 1890.

Secretary State Board of Agriculture, Columbia.

SIR—I herewith submit report of our fair for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	1	
Indebtedness (none).		
ASSETS.		
Land, number of acres, 40, value		$1,200
Buildings		800
"		1,000
"		150
"		200
"		100
Other improvements		500
Total		3,950
General condition of property fair.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Norman, number		30
Percheron		10
Cleveland Bay		8
Clydesdale		6
Cattle—		
Short-horn		6
Hogs—None presented.		
Sheep—None presented.		
Poultry—No premium.		
Farm and garden products, number of entries		101
Miscellaneous		56
Total number of entries		382
Total amount of premiums paid	$1,525 00	
Expenses other than for premiums	739 50	
Total receipts	3,160 00	

JNO. A. LEE, Secretary. WM. E. HILL, President.

CLARK COUNTY.

October 27, 1890.

Secretary State Board of Agriculture, Columbia.

SIR—I herewith submit report of the A. and M. Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	140	
Indebtedness, none.		
ASSETS.		
Land, number of acres, 30, value		$8,000
Buildings—		
Amphitheater		1,200
Floral hall		400
Barn		400
Stalls		500
Hog and sheep pens		300
General condition of property, good.		

EXHIBITS OF YEAR 1890.

Horses, breed—		
Grade, number		95
Standard bred stallions		6
Light harness		65
All purpose		58
Cattle—		
Short-horn		50
Thoroughbred Hereford		1
Thoroughbred Jersey		6
Galloway		4
Hogs—		
Poland-China		29
Chester White		20
Sheep—		
Long wool		28
Middle wool		37
Fine wool		22
Poultry—		
Brahma		2
Cochin		2
Leghorn		2
Plymouth Rock		3
Dominique		4
Wyandotte		12
Farm and garden products number of entries		190
Implements		10
Total amount of premiums paid	$2,473 00	
Expenses other than for premiums	1,760 26	
Total receipts	4,241 00	

JOSEPH VANDOLAH, Secretary. WILLIS BOLER, President.

CLINTON COUNTY.

CAMERON, March 31, 1891.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Cameron District Fair Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	45	
Indebtedness	$6,100	

ASSETS.

Land, number acres, 40, value		$2,400
Buildings—		
Grand stand		12,000
Floral hall		
Stables		
Pens		
Cow sheds		
Other improvements		150
General condition of property first class.		

EXHIBITS OF YEAR 1890.

Horses, breed—		
Thoroughbred, number		7
Clydesdale		5
Norman		8
All purpose		47

Cattle, breed—		
Polled Angus		8
Holstein Friesian		14
Short-horn		9
Jersey		17
Hereford		9
Hogs, breed—		
Berkshire		12
Poland China		36
Chester White		4
Sheep, breed—		
Merinos, all classes		13
Downs, all classes		13
Long wool, including all class combing wools		25
Poultry—		
Light Brahma		2
Plymouth Rock		3
Brown Leghorn		2
Wyandott		2
Bronze turkeys		3
Farm and garden products		149
Implements		1
Miscellaneous		1,090
Total number of entries		1,460
Total number of premiums paid		462
Total amount of premiums paid	$1,592 70	
Expenses other than for premiums	2,605 09	
Total receipts	4,031 00	

R. H. Alexander, Secretary. W. D. Cobberly, President.

DADE COUNTY.

Lockwood, January 6, 1891.

Secretary State Board of Agriculture, Columbia:

Sir—I herewith submit report of the Dade County A. & M. Association for the year 1890, as required by section 333 of the Missouri Statutes:

Indebtedness	$600	

Assets.

Land, number of acres, 20, value	$1,000
Buildings—	
Floral hall	500
Offices and band stand	100
Stalls	200
Well	20
Pond	80
Track, ½ mile.	
General condition of property good.	

Exhibits of Year 1890.

Horses, breed—	
Draft, number	19
Thoroughbred	2
Light harness	46
All purpose	55
Mules	34
Jacks	11
Jennets	2

Cattle—		
Short-horn		13
Polled Angus		1
Ayrshire		1
Grade		8
Hogs—		
Poland China		32
Chester White		1
Sheep—		
Southdown		10
Poultry—		
Buff Cochin, pairs		2
Plymouth Rock, Barred, pairs		4
Light Brahma, pairs		2
White Leghorn, pairs		2
Brown Leghorn, pairs		1
Black Minorca, pair		1
English Corsican, pair		1
Langshan, pairs		5
White Wyandott, pair		1
Bantams, pair		1
B. turkey		1
Geese, pairs		2
Bird		1
Ducks, pairs		2
Ducks, wild, pair		1
Total number of poultry		26
Farm and garden products		116
Implements		2
Miscellaneous		260
Total number of entries		834
Total number premiums paid		411
Total amount of premiums paid	$881 70	
Expenses other than for premiums and back indebtedness	582 40	
Total receipts	1,474 16	

C. E. Coupee, Secretary. Thos. McDermid, President.

DALLAS COUNTY.

Charity, Mo., 1890.

Secretary State Board of Agriculture, Columbia:

Sir—I herewith submit report of the Dallas county A. and M. Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	18	
Indebtedness	$250 00	
Assets.		
Land. number of acres, 21, value		$1,000
Buildings—		
Amphitheater		250
Stalls		150
Board enclosure		200
Art hall		....
General condition of property, fair.		

Remarks—Art hall blown down by storm to late for repair this season, consequently we held a free stock show October 16, 17 and 18. As it was a free show, we took no account of animals exhibited, but limited in numbers.

N. J. Wollard, Secretary. A. A. Ramsey, President.

DAVIESS COUNTY.

JAMESPORT, January 31, 1891.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Grand River Agricultural, Horticultural and Mechanical Association of Jamesport, for the year 1890, as required. by section 333 of the Missouri Statutes:

Number of members	85	
Indebtedness	$569	
ASSETS.		
Land. number of acres, 30, value		$1,500
Buildings—		
Halls		300
Stalls		1,000
Amphitheater		300
Other improvements		1,500
General condition of property good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
For all work, number		75
Roadsters		14
Draft		61
Cattle—		
Galloway, number		3
Holstein		8
Short-horn		13
Jersey		13
Hogs—		
Berkshire		4
Poland China		24
Other or cross		36
Sheep—		
Fine wool		19
Middle wool		14
Long wool		16
Poultry—		
All		27
Farm and garden products, number of entries		298
Miscellaneous, number of entries		143
Total number of entries		768
Total number premiums paid		279
Total amount premiums paid	$1,294 93	
Expenses other than for premiums	730 57	
Total receipts	2,009 75	

A. L. BUZARD, President.

A. P. SHOUR, Secretary.

GASCONADE COUNTY.

HERMANN, November 3, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Agricultural Association of Gasconade county for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	78	
ASSETS.		
Land, number of acres, 6.11, value		$1,000
Buildings—		
1 brick rotunda		500
2 frame exhibition		600
1 secretary's office		150
1 ticket office		50
Stalls		500
Other improvements		200
General condition of property, mostly old buildings, but in good repair; the grounds are in best of condition.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Norman, number of entries		4
Mixed		11
Cattle—		
Mixed		3
Durham		3
Hogs—		
Mixed		5
Sheep—		
Mixed		8
Poultry—		
All kinds		34
Farm and garden products, number of entries		202
Farm implements		54
Fruits and grapes		120
Wines		52
Ladies' handiwork		108
Miscellaneous		134
Total number of entries		738
Total number of premiums paid		126
Total amount of premiums paid	$386 50	
Expenses other than for premiums	67 35	
Total receipts	1,149 45	
Balance on on hand, November, 1889		$761 89
Total receipts to November, 1890		1,149 45
Total		1,911 45
Paid dividends	$105 00	
Paid repairs and improvements	477 16	
Paid premiums	386 50	
Paid fair expenses	67 35	
Total		1,036 01
Balance on hand		875 33

WM. C. BOING, Secretary. AUG. C. LEISNER, President.

GENTRY COUNTY.

ALBANY, October 20, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Gentry County Fair Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	34	
Indebtedness (none).		
ASSETS.		
Land, number of acres 65, value		$3,000
Buildings—		
Hall		1,500
Stalls		500
Judges' stand.... Track, fence, etc.		750
Cash on hand		500
General condition of property fair.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Thoroughbred, number of entries		2
Draft		22
Standard		3
All purpose		49
Saddle		3
Speed ring		44
Jack stock		1
Cattle—		
Jersey		3
Hogs—		
Poland China		39
Sheep—		
Cotswold		12
Poultry—		
Displays		6
Farm and garden products, number of entries		18
Miscellaneous, floral hall		487
Total number of entries		689
Total number premiums paid		288
Total amount of premiums paid	$1,261 75	
Expenses other than for premiums	670 00	
Total receipts from all sources	2,446 55	

R. M. MCCAMMON, Secretary,   E. L. PERRY, President.

GRUNDY COUNTY.

TRENTON, MO., Oct. 30, 1890.

Secretary State Board of Agriculture, Columbia.

SIR—I herewith submit report of the N. Mo. C. A. & I. A. for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	46	
Indebtedness		$1,526 40
ASSETS.		
Land, number of acres 23, value		$3,500
Buildings—		
Floral hall		500
Horse stalls		1,250
Cattle stalls		300
Hog pens		100
Sheep pens		50
Other improvements		1,000
General condition of property: Has been used a number of years; has deteriorated some; fence needs repair.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Thoroughbred		9
Grade, draft		45
All purpose		72
Saddle, mule teams and roadsters		36
Cattle—		
Durham		12
Polled Angus		6
Hereford		4
Holstein		8
Jersey		3
Hogs—		
Berkshire		5
Poland China		23
Jersey Red		1
Chester White		5
Sheep—		
Fine wool merino		11
Long wool		4
Poultry—		
Asiatic		4
Hamburgh		1
Spanish		1
French		1
Game		1
Bantam		4
Mules and jacks, entries		21
Grade cattle		2
Herds		4
Sweepstake cattle		8
" hogs		21
" sheep		13
" jacks		2
American fowls		2
Geese		1
Ducks		1
Pigeons		1
Race horses		55
Farm and garden products, number of entries		23
Miscellaneous		471
Total number of entries		875
Total number of premiums paid		237
Total amount of premiums paid	$1,549 49	
Expenses other than for premiums	648 94	
Total receipts	3,081 31	

PETER H. YAKEY, Secretary.

J. W. SMITH, President.

HARRISON COUNTY.

November 1, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Ridgeway A. and M. for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	5	
Indebtedness	$16 00	
ASSETS.		
Land, number of acres 40, value		$2,000
Buildings—3		1,000
General condition of property, good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
All purpose, number		22
Carriage		21
Normans' Clydes		4
Draft		27
Mules, jacks, etc		8
Cattle—		
Jersey		3
Hogs		15
Sheep		20
Poultry		3
Farm and garden products, number of entries		120
Farm implements, number of entries		18
Miscellaneous, number of entries		100
Total number of entries		361
Total number premiums paid		134
Total amount premiums paid	$639 00	
Expenses other than for premiums	456 80	
Total receipts	14 36	

GEO. T. KIRK, Secretary. E. MONSON, President.

HENRY COUNTY.

February 6, 1891.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Henry County Fair for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	46	
Indebtedness, none.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Draft, number of entries		17
Roadster		46
All purpose		47
Harness and buggy		31
Model animals		20
Cattle—		
Short-horn		20
Jersey		10
Hogs—		
Berkshire		17
Poland China		27
Essex		5
Sheep—		
Long wool		5
Middle wool		10

Poultry—		
All kinds		69
Farm and garden products, number of entries		197
Farm implements		40
Miscellaneous		175
Total amount of premiums paid	$1,875 50	
Expenses other than for premiums	690 00	
Total receipts	2,704 20	

Remarks.—Association does not own any property, but lease from the Natural Gas Development company, of Clinton, during fair time.

Thos. Day, Secretary. S. Blatt, President.

JOHNSON COUNTY.

Holden, October 29, 1890.

Secretary State Board of Agriculture, Columbia:

Sir—I herewith submit report of the Holden A. and M. Fair Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members (directors)	13	
Indebtedness, none.		
Assets.		
Land, number of acres, none.		
Buildings—		
Floral hall and other improvements		$1,000
Other property, none.		
General condition of property, fair shape.		
Exhibits of Year 1890.		
Horses, breed—		
All purpose, number of entries		96
Draft		30
Harness		68
Saddle		17
Cattle—		
Short-horn		16
Hogs—		
Sweepstakes		27
Poland China		21
Berkshire		16
Sheep—		
Spanish merino		8
Cotswold		4
Downs		6
Poultry—		
Bantam		4
Wyandott		6
Light Leghorn		4
Patridge Cochin		2
Buff Cochin		1
Brown Leghorn		4
White Leghorn		1
Plymoth Rock		5
Farm and garden products, number of entries		161
Farm implements		42
Miscellaneous		216
Total number of entries		752
Total amount of premiums paid	$1,108	
Expenses other than for premiums	652 0	
Total receipts	2,700 0	

Remarks.—Largest exhibit of stock and largest attendance we have ever had.

J. V. Murray, Secretary. D. T. Boisseau, President.

LIVINGSTON COUNTY.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the North Missouri Agricultural and Mechanical Society of Livingston county for the 1890, as required by section 333 of the Missouri Statutes:

Number of members, don't know; 185 certificates issued, amounting to..		$11,400
Estimated amount of outstanding receipts on which stock has not been issued		600
Total		12,000
Clear profits of fair		2,053
Total		$14,053
Indebtedness		474
ASSETS.		
Land, number of acres 65, value		5,000
Buildings—		
Amphitheater		2,000
Floral hall		700
Music stand		200
200 stock stalls		2,000
Other improvements		4,627
General condition of property good, all new.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
All breeds of draft, full-blood and graded horses, race and saddle		230
Mules		10
Jacks—		
Spanish and Black Warrior		8
Cattle—		
Durham, Holstein, Jersey, Graded, Hereford, Polled Angus		100
Hogs—		
Berkshire		60
Essex		62
Poland China		60
Chester White		65
Sheep—		
Best class merino		85
Poultry—		
White Brahma		10
Buff Cochin and P. Cochin		10
White Leghorn		8
Plymouth Rock		8
White Bantam		8
Bronze turkey and P. ducks		20
Total number of entries		1,596
Total number of premiums paid		374
Total amount of premiums paid	$2,116	
Expenses other than for premiums	581	
Total receipts	4,751	

J. M. GIRDNER, Secretary. W. E. GUNBY, President.

LIVINGSTON COUNTY.

AVALON, October 23, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Livingston Co. fair for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	86	
Inbdetedness	$1,500	
ASSETS.		
Land, number of acres 60 value, leased.		
Buildings		$100
General condition of property good.		
EXHIBIT OF YEAR 1890.		
Horses, breed—		
Full bloods		20
Grades and crosses		100
Seed		30
Jacks and mules		10
Cattle—		
Jersey		2
Short-horn		7
Hogs—		
Berkshire		5
Poland China		22
Sheep, long wool		6
Poultry—		
Chickens, 18 coops		40
Geese		10
Total number of entries		652
Total amount of premiums paid	$800 00	
Total receipts	1,200 20	

REMARKS.—Above find a brief report of the Agricultural and Mechanical Fair association of Avalon, Livingston county, Mo.

R. T. MILLER, Secretary. T. F. SCOTT, President.

MACON COUNTY.

LAPLATA, October 24, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the LaPlata Fair Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members, 52 stockholders, 105 shares, $25 each.	
Indebtedness, none.	
ASSETS.	
Land, number of acres, 33, leased.	
Buildings—	
Amphitheater	$1,200
Barn	500
Stalls	900
Judges' and band stand	150
Coops, pens and out-houses	150
Track	200
Total	$3,100
General condition of property good.	

Exhibits of Year 1890.		
Horses, breed—		
All breeds and ages, number of entries		100
Jacks		9
Mules, all ages		14
Cattle—		
Holstein, Jersey, Herford, Short-horn		36
Hogs—		
Poland China and Chester White		20
Sheep		10
Poultry, 20 entries or 40 fowls.		
Farm implements, number of entries		3
Miscellaneous		267
Total number of entries		519
Total amount of premiums paid, about	$1,699	
Expenses other than for premiums, about	810	
Total receipts, about	2,650	
The association made improvement of		$170
Paid back indebtedness		100
Cash in treasury		165

J. W. Vwhers, Secretary. A. S. Rais, President.

MERCER COUNTY.

Princeton, October 20, 1890.

Secretary State Board of Agriculture, Columbia:

Sir—I herewith submit report of the Mercer County Association and Mechanical Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members, stock company.		
Indebtedness	$1,500	
Assets.		
Land, number of acres 40, value		$400
Buildings—		
80 double stalls		800
40 single stalls		300
40 sheep and hog pens		300
Floral hall		400
Amphitheater		500
Other improvements, track fenced		1,000
Other property, judges' stand		150
General condition of property good,		
Exhibit of Year 1890.		
Horses		110
Mules		19
Cattle—all breeds		25
Hogs—all breeds		42
Sheep—all breeds		60
Poultry—all breeds		50
Farm and garden products, number of entries		200
Farm implements, floral hall		100
Miscellaneous, floral hall		40
Total number of entries		646
Total amount premiums paid	$995 50	
Expenses other than for premiums	473 25	
Total receipts	1,763 25	

Remarks—We only had three days' fair; the fourth day we threw the gates open free, as the weather was bad.

Wm. Hirons, Secretary. W. F. Buren, President.

MONROE COUNTY.

MONROE CITY, October 21, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Monroe City District Fair Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	66	
Indebtedness	$2,800	
ASSETS.		
Land, number of acres, 42.2, value		$1,680
Buildings—		
Amphitheater		600
Floral, agricultural and merchants' display halls		750
Dining hall		175
Stalls		1,300
Band stand		75
Secretary and directors' office		50
Fences		250
Implement hall		50
Other property		350
Total		5,280
Condition of property, first class.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Saddle, number		47
Harness		68
Draft		33
Trotting, running and pacing		49
Sundry rings		58
Mules, jacks and jennets		36
Cattle—		
Polled Angus or Galloway		8
Short-horn		13
Jersey		8
Hereford		14
Sundry rings		9
Hogs, all breeds		38
Sheep, all breeds		46
Poultry, all breeds		43
Farm and garden products, number of entries		238
Farm implements, " "		14
Miscellaneous, " "		335
Total number of entries		1,021
Total number of premiums paid		406
Total amount of premiums paid	$2,640 25	
Expenses other than for premiums	909 80	
Total receipts	3,550 05	

REMARKS.—Causes of such heavy indebtedness, buying more land and general overhauling and improvements of grounds and buildings during the last year. We gave a premium of $100 for the best county display of agricultural products—Marion, Monroe, Ralls and Shelby counties, the only eligible counties. Awards: Ralls, 1st; Marion, 2nd; Monroe, 3d; Shelby, no exhibit. Capital stock, $4,000; 80 shares, $50 each.

GEO. W. TOMPKINS, Secretary, J. M. PROCTOR, President.

MONROE CITY, MO., October 21, 1890.

DEAR SIR—Enclosed you will find report of our last fair. I am sorry that I did not know that reports had to be made to you before, as our last fair was the fourth one held, and we are proud of our little fair, and from looking over last year's fairs in your report, we could keep up with a majority of them. The first, second and third, we had only a ¼-mile track—"good pumpkin fair," as some called us—but now we have one of the best ½-mile tracks in the State; do not know whether that will make it any better for us or not. We had to move all of our buildings and buy more ground to make our ½-mile track, and that is the cause for our being so far behind or indebted.

Hoping that our President, James M. Proctor, Esq., will be able to meet with you at your annual meeting, I am yours, etc.,

GEO. W. TOMPKINS, Sec'y.

P. S.—Our assets would go much higher if we would place them at what they cost us; they are at figures that they are worth at the present time.

MONTGOMERY COUNTY.

MONTGOMERY CITY, October 22, 1890.

Secretary State of Board of Agriculture, Columbia:

SIR—I herewith submit report of the Montgomery Co. A. & M. Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	1	
Indebtedness (none.)		
ASSETS.		
Land, number of acres 40, value	$3,500 to	$4.000
Buildings		1,000
General condition of property, fair.		
EXHIBIT OF YEAR 1890.		
Horses, breed—		
Gold Dust, number		28
Percheron		14
Clydesdale		10
Other grades		87
Cattle—		
Jersey		10
Short-horn		15
Black Spanish		8
Polled Angus		9
Grade cattle		28
Hogs—		
Berkshire		7
Poland China		13
Essex		9
Sheep—		
Cotswold		6
Southdown		14
Fine wool		11
Poultry—		
Black Spanish		6
Cochin China		4
Plymouth Rock		8
Langshan		4
Seabright		4
Other varieties		26
Farm and garden products, number of entries		80
Farm implements		6
Miscellaneous		150
Total number of entries, about		500
Total number of premiums paid, about		300
Total amount of premiums paid	$3,500	
Expenses other than for premiums	500 to 600	

REMARKS—We had a very successful fair. The stock exhibit was superb. The attendance was large.

JAMES R. HANCE, Secretary. ALFRED DAVAULT, President.

PIKE COUNTY.

LOUISIANA, MO., October 22, 1890.

Secretary State Board of Agriculture, Columbia, Mo.:

SIR—I herewith submit report of Pike County Fair Association for the year 1890, as required by section 333 of the Missouri Statutes:

Indebtedness, about	$3,000 00	
ASSETS.		
Land, number of acres, 26, value		$2,000 00
Buildings—		
Amphitheater		1,700 00
Stalls, 200		1,600 00
Other buildings		200 00
General condition of property, good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Breed unknown		49
Gentlemen drivers		8
Carriage, draft and saddle		10
Draft		81
All work		27
Cattle—		
Galloway		16
Jersey		16
Hogs—		
Any breed		18
Sheep—		
Shropshire		8
Southdown		4
Total number of entries		187
Total amount of premiums paid, including speed ring, about	$3,800 00	
Expenses other than for premiums, about	500 00	
Total receipts	8,000 00	

REMARKS.—We are making the last assessment of 50 per cent. Stock is changing hands, and it is impossible at the present time to give the number of stockholders. Capital stock, $7,500. Shares, $25 each.

FRANK P. LONERGAN, Secretary. J. J. MCCUNE, President.

PLATTE COUNTY.

October 25, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Platte County A., M. and S. Association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	100	
Indebtedness	$900	
ASSETS.		
Land, number of acres, 21, value		$2,000
Buildings—		
Grand stand		1,000
Floral hall		700
Judges' stand		100
Secretary's office		50
One hundred stalls		1,000
Other improvements		500
Other property, race track		1,000
General condition of property (all good, the grand stand and floral hall and 30 stalls having been built in 1889, and fencing and 30 stalls built in 1890).		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Thoroughbred, number		8
Saddle		52
Draft		12
Harness		51
All purpose		7
Cattle, breed—		
Jersey		7
Polled Angus		2
Galloway		3
Hereford		3
Hogs		6
Jack stock		23
Sheep		5
Poultry		9
Farm and garden products, number of entries		68
Implements		37
Miscellaneous, fine arts, needle-work, etc		107
Total number of entries		400
Total number of premiums paid, including races		198
Total amount of premiums paid, including races	$1,692 50	
Expenses other than for premiums	5,907 03	
Total receipts	7,687 93	

REMARKS.—Before the beginning of our fair this year we were in debt $1,855.63. We borrowed $3,100. Out of the loan we paid the old debt off and used remainder of loan in improvements on grounds. After our fair, after paying all claims against the association, we reduced our debt to $900. Have a little in the treasury and a little more still due us and unpaid. Our annual regular meeting is in April, so this report is made out by the Secretary. We believe it to be exact, except the values of the property, which are of course only estimated.

WM. FORMAN, Secretary. A. D. BURNES, President.

POLK COUNTY.

November 14, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Polk County Agricultural and Mechanical society for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	188	
Indebtednes	$1,147	

ASSETS.

Land, number of acres 38, value	$6,000
Buildings—	
Exhibition hall, value	2,000
Grand stand	1,000
Stalls	700
Stock pens	300
General condition of property, all in good condition.	

EXHIBITS OF YEAR 1890.

Horses, breed—		
All work, number		51
Saddle horses		22
Roadsters		13
Draft		42
Cattle, breed—		
Standard, number		4
Short-horns		11
Holstein		19
Jersey		9
High grade		12
Hogs, breed—		
Berkshire, number		8
Poland China		40
Chester White		2
Sheep, breed—		
Merino, number		15
South Down		3
Cotswold		18
Poultry, breed—		
Chicken, Asiatic, number		8
Plymouth Rock		10
Turkeys, Bronze		2
Ducks, Pekin		5
Ducks, Mallard		2
Geese, Toulouse		2
Farm and garden products, number of entries		97
Farm implements, number of entries		6
Miscellaneous, number of entries		261
Total number of entries		671
Total number premiums paid		330
Total amount of premiums paid	$557 20	
Expenses other than for premiums	1,303 04	
Total receipts	2,245 68	

S. R. JOHNSON, Secretary. H. C. TURK, President.

RANDOLPH COUNTY.

November 1, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Randolph County A. and M. Society for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	92	
Indebtedness, none.		
ASSETS.		
Land, number of acres, 5, value		$250
Buildings—		
Amphitheater		452
Floral hall		200
Stalls		350
General condition of property good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Draft, number		71
Harness		65
All purpose		59
Saddle		34
Buggy		16
Mules		42
Jacks and jennets		16
Cattle—		
Jersey		6
Hereford		8
Polled Angus		3
Short-horn		24
Hogs—		
Berkshire		10
Poland China		2
Sheep—		
Long wool		4
Middle wool		11
Fine wool		14
Poultry—		
White Plymouth Rock		1
White Minorca		1
Black Langshans		1
Partridge Cochin		2
Wyandotte		1
Other breeds		5
Farm and garden products, nnmber of entries		38
Farm implements, variety.		
Miscellaneous		282
Total number of entries		717
Total number of premiums paid		206
Total amount of premiums paid	$665	
Expenses other than for premiums	356	
Total receipts	1,508	

REMARKS.—We have no racing, no whisky or spirits of any kind sold on grounds. We did not have a single disturbance from drunkenness or any other cause. We allow no gambling or chance games on the grounds.

B. F. COULTER, President.

W. S. COULTER, Secretary.

RAY COUNTY.

LAWSON, Mo., October 20, 1890.

Secretary State Board of Agriculture, Columbia, Mo.:

SIR—I herewith submit report of the Lawson District A., M. and Fair Association for the year 1890, as required by section 333 of the Missouri Statutes:

Indebtedness	$2,200	
ASSETS.		
Land, number of acres 27½, value		$2,000
Buildings		2,000
General condition of property good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Thoroughbred, number		1
All purpose		34
Roadster		35
Draft		10
Saddle		17
Jack and jennets		11
Cattle—		
Thoroughbred, Short-horn		8
Jersey		1
Holstein		3
Bred for milk or beef		11
Hogs—		
Poland China		11
Red Berkshire		10
Chester White		5
Sweepstakes, premium		8
Sheep—		
Long wools, including all classes combing wools		14
Mules		8
Poultry—		
Brahma		5
Buff Cochin		4
L. Wyandotte		2
Plymouth Rock		4
P. ducks, pair		1
Farm and garden products, number of entries		34
Miscellaneous		78
Total number of entries		325
Total number of premiums paid		194
Total amount of premiums paid	$878 00	
Expenses other than for premiums, buildings, etc	1,272 00	
Total receipts	2,150 00	

D. W. GIBBONS, Secretary. R. H. FINCH, President.

SCHUYLER COUNTY.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the Schuyler County Fair Company for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	9	
Indebtedness	$900	
ASSETS.		
Land, number of acres 34, value		$1,700
Buildings		1,000
General condition of property good.		
EXHIBITS OF YEAR 1890.		
Horses, breed—		
Cleveland Bay, number		1
Norman		2
Roadster		10
Grade		47
All purpose		40
Hogs—		
Berkshire		8
Poland China		10
Sheep		24
Poultry		40
Farm and garden products, number of entries		40
Farm implements		20
Miscellaneous		200
Total number of entries		442
Total amount of premiums paid	$1,007 90	
Expenses other than for premiums	660 00	
Total receipts	$1,667 90	

REMARKS—Our company is not incorporated, but is a private fair company. We are going out of business with this year; will sell our fair grounds. There is a new company forming which will organize under the laws of the State and incorporate.

N. S. ROBERTS, Secretary. J. P. PAYTON, President.

ST. CHARLES COUNTY.

ST. CHARLES, Mo., Oct. 31, 1890.

Secretary State Board of Agriculture, Columbia:

SIR—I herewith submit report of the St. Charles Co. Driving Park and Fair association for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	411	
Indebtedness	$3,000	

ASSETS.

Land, number of acres 41¼, value		$12,375
Buildings—		
Exhibition hall		500
Grand stand		200
Eating stand		100
House of comfort		500
168 stalls		1,500
General condition of property good.		

EXHIBITS OF YEAR 1890.

Horses, number		62
Cattle, number		25
Hogs, number		35
Sheep, number		5
Poultry, entries, number		54
Farm and garden products, number of entries		226
Farm implements, number of entries		4
Miscellaneous, number of entries		320
Total number of entries		731
Total number of premiums paid		245
Total amount of premiums paid	$1,752 98	
Expenses other than for premiums	858 77	
Total receipts	5,034 40	

J. F. RAUCH, Secretary. C. T. MALLINCKRODT, President.

SULLIVAN COUNTY.

MILAN, Mo., November 15, 1890.

Secretary State Board of Agriculture, Columbia :

SIR—I herewith submit report of the Association September 2, 3, 4, 5 and 6, for the year 1890, as required by section 333 of the Missouri Statutes:

Number of members	49	
Indebtedness (none).		

ASSETS.

Land, number of acres 37½, value		$1,875
Buildings—		
Floral hall		400
Agricultural hall		150
Amphitheater		350
Other improvements		1,000
General condition of property fair.		

EXHIBITS OF YEAR 1890.		
Horses, breed—		
Mixed		75
Draft		45
Cleveland Bay and coach		3
Clyde and Shire		3
Cattle—		
Galloway and Angus		3
Jersey		2
Hereford		13
Short-horn		20
Hogs—		
Poland China		10
Sheep—		
Middle wool		14
Poultry—		
Plymouth Rock		10
Farm and garden products, number of entries		120
Farm implements		7
Miscellaneeus		400
Total number of entries		816
Total number premiums paid		359
Total amount of premiums paid	$1,427 50	
Expenses other than for premiums	941 40	
Total receipts	2,490 25	

REMARKS.—We have about $500 cash on hand that belongs to the Association from last year and this. We had the best fair this fall that we have ever had; more stock and a better quality, and our fairs seem to be improving. We think we have the finest natural fair grounds in the State. We have 87 good box stalls.

WM. MCCLANAHAN, Secretary. ADDISON PAYNE, Presidet.

MISSOURI FAIRS—1890.

County.	Where held.	Name of Secretary.	Date.
Adair	Kirksville	C. E. Darrow	Sept. 15, 16, 17, 18, 19
Audrain	Mexico	J. A. Glandon	Aug. 6, 7, 8, 9
Atchison	Rockport	W. J. Bunting	Sept. 16, 17, 18, 19
Barton	Lamar	Walter J. Miller	Sept. 29, 30, Oct. 1, 2, 3
Caldwell	Hamilton	A. C. Menifee	Aug. 26, 27, 28, 29, 30
Callaway	Fulton	Elwood Tuttle	Aug. 16, 17, 18, 19, 20
Cape Girardeau	Cape Girardeau	E. G. Engleman	Oct. 14, 15, 16, 17, 18
Cass	Belton	J. R. McNutt	Aug. 26, 27, 28, 29, 30
Carroll	Carrollton	Bedford Hudson	Sept. 9, 10, 11, 12, 13
Chariton	Keytesville	John A. Lee	Oct. 7, 8, 9, 10, 11
Clark	Kahoka	Joseph Vendolah	Aug. 26, 27, 28, 29
Clinton	Cameron	R. H. Alexander	Sept. 3, 4, 5, 6
Dade	Lockwood	C. E. Confer	Oct. 7, 8, 9, 10, 11
Dallas	Buffalo	N. J. Wollard	
Daviess	Jamesport	A. P. Shour	Sept. 2, 3, 4, 5
Franklin	Washington	Albert C. Krug	Sept. 4, 5, 6
Gasconade	Hermann	Wm. C. Boing	Aug. 29, 30
Gentry	Albany	R. M. McCammon	Aug. 26, 27, 28, 29
Greene	Springfield	H. H. Simmons	Sept. 8, 9, 10, 11, 12, 13
Grundy	Trenton	Peter H. Yakey	Sept. 9, 10, 11, 12
Harrison	Ridgeway	Geo. T. Kirk	Sept. 9, 10, 11, 12
Henry	Clinton	Thos. Day	Sept. 3, 4, 5, 6
Jasper	Sarcoxie	J. M. Rice	Oct. 7, 8, 9, 10
Johnson	Holden	J. V. Murray	Aug. 26, 27, 28, 29
Knox	Edina	J. W. Ennis	Aug. 19, 20, 21, 22
Lafayette	Higginsville	C. Vivian	
Livingston	Chillicothe	John W Graves	Sept. 28
Livingston	Avalon	R. T. Miller	Sept. 2, 3, 4, 5
Macon	LaPlata	J. W. Voorhes	Sept. 9, 10, 11, 12
Marion	Palmyra	G. B. Thomas	Sept. 30, Oct. 1, 2, 3, 4
Marion	Hannibal	D. H. Shields	Sept. 23, 24, 25, 26
Mercer	Princeton	Wm. Hirons	Sept. 16, 17, 18, 19, 20
Moniteau	California	Robt. T. Short	Sept. 16, 17, 18, 19
Monroe	Paris	T. T. Rodes	Aug. 19, 20, 21, 22, 23
Monroe	Monroe City	Geo. W. Tompkins	Sept. 16, 17, 18, 19, 20
Montgomery	Montgomery City	J. R. Hance	Sept. 16, 17, 18, 19, 20
Pettis	Sedalia	A. L. Burr	Aug. 19, 20, 21, 22, 23
Polk	Bolivar	S. R. Johnson	Sept. 16, 17, 18, 19, 20
Pike	Louisiana	Frank P. Lonergan	July 28, 29, 30, 31, Aug. 1
Platte	Platte City	Wm. Forman	Aug. 26, 27, 28, 29, 30
Putnam	Unionville	John A. Helterstein	Aug. 27, 28, 29, 30
Randolph	Moberly	Ben. Levy	Aug. 12, 13, 14, 15, 16
Randolph	Jacksonville	W. S. Coulter	Aug. 18, 19, 29
Ray	Lawson	D. W. Gibbons	Aug. 19, 20, 21, 22
St. Charles	St. Charles	J. T. Rauch	Sept 10, 11, 12
Saline	Marshall	T. E. Spencer	Sept. 1, 2, 3, 4, 5, 6
Schuyler	Lancaster	N. T. Roberts	Sept. 10, 11, 12, 13
Scotland	Memphis	J. P. Nesbit	Sept. 2, 3, 4, 5
Shelby	Shelbina	R. C. Dickinson	Sept. 9, 10, 11, 12, 13
Sullivan	Milan	Wm. McClanahan	Sept. 2, 3, 4, 5, 6
St. Louis city		W. C. Bellars	Oct. 6, 7, 8, 9, 10, 11

CROP REPORTS

OF THE

MISSOURI STATE BOARD OF AGRICULTURE,

FOR THE SEASON OF 1890.

MARCH.

COLUMBIA, Mo., April 5, 1890.

This, the first crop report of the season issued by the Missouri State Board of Agriculture, is compiled from returns from correspondents in every county in the State, excepting Carter, Dunklin and Oregon, who failed to report in time.

CLIMATIC CONDITIONS.—The weather during the winter just past has been remarkably mild, there being but little freezing weather until March, during which month we have had the most unfavorable climatic conditions of the season.

WHEAT.—Quite favorable conditions prevailed at wheat seeding time last fall (excepting in a few localities where the soil was too dry), and the crop was put in in good condition. The seed germinated fairly well and the plants made a good start, continuing to grow until late into the winter, making, generally, a very fine appearance. But with the first of March came freezing weather without snow, which, alternating with mild spells, continued throughout the month, the effect of which has been very injurious to the wheat plant. In many instances the plants had jointed, and it is feared that when that is the case they are dead. There has been almost an entire lack of protection by snow, and as a result the plant has been badly bleached since freezing weather came, so that probably it is not in as bad condition now as it seems to be. Many correspondents hold this view, and say that the recent favorable weather has greatly improved its appearance.

Owing to the long-continued growing weather of the fall and early winter, the Hessian fly worked more extensively than usual.

Rye has suffered less than wheat from the recent freezing weather. This crop is not, however, very extensively grown for the grain. A considerable area is usually sown for fall and winter pasture.

FRUIT.—The warm weather during the winter caused fruit buds to start, particularly peach-buds, which in portions of the state burst into full bloom, resulting in their almost complete destruction. Early apple and pear-buds are thought to be more or less injured, but it is a little early to make an estimate of the extent of the damage. Small-fruit plants have also been injured to a considerable extent. Their comparative condition, with that of orchards, is indicated in the table of summaries.

LIVE STOCK.—Unusually abundant forage and grain crops of last season, good fall and winter pasture and mild weather, is a remarkable combination of conditions for stock, but the comparative condition as indicated in the table of summaries is not as good as might be expected. Why is this? The principal cause for the low relative condition, considering the favorable circumstances, will be found, we think, in the fact that where and when natural conditions are regarded as favorable the stockman is more apt to allow his stock to shift for themselves. Feeding is irregularly and imperfectly done, and the stock suffers the full effect of bad weather. The more completely the character of the stock and surrounding conditions bring the farm stock directly under the eye and care of the owner, the better will be the condition and the lighter will be the loss. A study of the figures in the table of summaries will show this.

It will be seen that horses stand highest in condition, cattle next, sheep third and hogs lowest. The same order will be noticed in the figures showing number of animals lost during the year in each 1,000 head. It will be readily conceded that horses are best cared for among farm stock, and the care given to other classes decreases with cattle, sheep and hogs.

Looking at the figures from another stand-point, it will be seen that in those sections of the State, the southern, where the natural conditions (of climate and wild range) are considered more advantageous to stock raising, as a rule the condition of the stock is lowest and losses heaviest. The effect, too, of increased value of stock can also be seen, for in those sections of the State in which the stock is the best bred the best showing is made.

ANIMAL DISEASES.—Diseases among horses have not been more than usually prevalent. There has been the usual run of distemper and other ordinary diseases. Glanders exist to a considerable extent throughout the State.

Among cattle black-leg has been prevalent. The following communication from Dr. Paul Paquin, State Veterinarian, in reference to this disease, is inserted:

BLACK-LEG.

LEVI CHUBBUCK, *Sec'y State Board of Agriculture:*

In compliance with your request I submit the following:

This disease is exceedingly prevalent, and the losses thereby to farmers indivually and to the country at large are enormous. The writer has given some thought to the subject and instituted researches as far back as 1886. It is only in the last twelve months, however, that our experiments gave sufficient evidence to be of practical use for the public good. As a result, and yielding to a public demand, an illustrated bulletin on Black-leg, explaining the nature of the malady and treatment thereof, is being prepared and will be out in about two weeks. It will be sent free on application. A bulletin on Texas fever will be ready for distribution in a few days. Those wishing copies of these bulletins should address the Secretary of the Agricultural Station, Columbia, Mo.

PAUL PAQUIN,
State Veterinarian.

Columbia, Mo.

Dogs have continued their devastating work on the sheep flocks of the State, and as a consequence, the number of sheep continues to decrease, as has been the case now for a number of years. They are becoming scarce and are in demand.

Hogs have died in large numbers from the different diseases all of which are called cholera. The true hog cholera undoubtedly exists in many of the counties of the State, and in some has caused extensive losses, some correspondents reporting that fully 50 per cent of the hogs in their localities have died. It is to be hoped that the veterinarians will shortly be able to advise a practicable remedy for this disease.

SUMMARY OF RETURNS.

Percentage condition of	The State....	Northeast Mo..	Northwest Mo.	Southeast Mo..	Southwest Mo.	Central Mo...
	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.
Wheat	85	83	95	85	83	81
Rye	93	90	97	94	98	85
Horses	99	98	98	97	99	99
Cattle	98	98	99	94	99	99
Sheep	97	96	98	95	99	98
Hogs	91	96	92	87	91	90
Apple orchards	93	92	96	90	92	87
Peach orchards	74	80	62	72	74	80
Strawberries	92	87	99	86	93	92
Raspberries	91	85	93	92	97	90
Blackberries	95	92	98	95	95	
Number lost per 1,000 head during last year:						
Horses	9	9	9	7	15	5
Cattle (by exposure)	8	3	3	14	9	6
Cattle (by other causes)	14	12	11	17	18	15
Sheep (by exposure)	7	5	4	6	9	11
Sheep (by other causes)	29	27	18	26	39	32
Hogs	88	35	115	128	73	90

APRIL 1890.

COLUMBIA, MO., May 7, 1890.

From data furnished by correspondents of the Board of Agriculture in every county of the State the following report on the condition and areas of crops, pastures and fruits and progress of farm work is compiled:

CLIMATIC CONDITIONS.—The rain-fall during the month was light, particularly in the northern half of the State. In Southeast Missouri there has been an excess of rain. Frosts occurred in North Missouri on the 10th, 17th, 18th and 27th. At Liberty, Mo., ice was made on the 10th.

WHEAT.—Taking the State as a whole, wheat has declined in condition two points during the past month. In the western part of the State there was a slight improvement, but in Northeast, Southeast and Central Missouri there has been a falling off in condition. Rain-fall has been below normal in the northern part of the state, the effect being injurious to the plants, already weakened by the March freezing. As will be seen by reference to the table of summaries, a considerable area of wheat has been plowed up, more in those sections in which the condition is low than elsewhere. More would have been plowed up but for the fact that much of the land was seeded with grass and clover.

Oats.—A smaller acreage of oats has been sown in all sections of the State this season than last, excepting in Northwest Missouri, although there are counties in all sections in which the acreage has been increased. The principal cause for the decrease in area in this crop is the low price for which last season's crop was sold. Other and more local causes have had their effect. In Southeast Missouri continuous rains hindered sowing until too late.

Flax is taking the place of oats to a considerable extent in Southwest Missouri, and the area has been increased in other sections. This crop is worthy of more extensive culture by the farmers of Missouri. It is one that makes quick cash returns, and, with an average yield and at prevailing prices, is fairly remunerative. As a fitting-crop for wheat or grass it is one of the best. It is regarded as being hard on the land, but is so only when the entire crop is removed from the soil. Nearly all of the material of the plant derived from the soil is in the straw, and if this be returned to the land the crop is not exhaustive. This can readily be done and at the same time increase the value of the crop. If cut while the straw is a little green and threshed without exposure to rains, the straw, with the small amount of seed retained, makes a nutritious food that is relished by stock, and well worth the trouble of saving. Then by carefully saving the manure and returning this to the land, but little need be feared of soil exhaustion in this direction, particularly if a small quantity of oil cake (the residue after pressing the oil from flax-seed) is fed to the farm stock.

Castor Beans are also being planted more extensively this season than for some years past. In response to a request from one of our correspondents, an article on the culture of this crop was prepared and published in the "Live Stock Indicator," Kansas City, of April 24, and "Colman's Rural World," St, Louis, of May 1.

Blue-grass Seed.—The depression of agricultural interests is such that any suggestion to the farmers of the State as to how their incomes may be increased will be appreciated. Trumbull, Reynolds & Allen, seedsmen, Kansas City, Mo., make the following statement concerning blue-grass seed as a source of profit:

> The great source of supply of blue-grass seed is Kentucky. $100,000 are sent annually to that State from Missouri for seed to meet the demands of our farmers. A considerable quantity of Missouri grown seed is secured, and there is no reason why the $100,000 worth imported from Kentucky should not be, and the money now sent to that State kept at home. From fifteen to thirty bushels of seed per acre can be secured from well-set grass when not pastured in the spring.
>
> The difficulty, heretofore, has been in harvesting the seed, it being a slow, laborious task. But by the use of the Thomasson & Pence rotary-cylinder blue-grass seed stripper, manufactured by T. R. & A., from one to two hundred bushels

of seed can be gathered in a day, and the grass is not injured in the slightest degree for fall and winter pasture, when it is most valuable. The seed is worth in the market not less than $1 per bushel.

Cotton planting in the few counties in Southeast Missouri in which this crop is grown, has been seriously interfered with by the excessive and continuous rains in that section. But little of the proposed crop was planted May 1, when ordinarily nearly all would have been.

Fruits.—Early apples were injured by the March freezes. The prospect is fair for a crop of winter apples. There will be a much better crop of peaches than was anticipated last month. Pears, plums and cherries were more or less injured, as were also small fruits, but the latter not so much as the larger fruits.

Spring Plowing.—The season is somewhat later than usual in all sections except in Northwest Missouri, as will be seen by reference to the figures in the table of summaries showing the proportion of spring plowing done. In Southeast Missouri the backwardness of the work is the result of excessive rains.

Grass Land.—The area of mowing and pasture land is still increasing, due to the low prices of grain, the more detrimental effect of grain crops on the land, and the increasing tendency to raise stock. It will be seen by the table of

Live-stock statistics how general has been the increase in live stock, notwithstanding low prices. In only one class of live stock, sheep, was there a decrease in numbers from 1888 to 1889; and this class commanded and still commands, relatively, the highest price. The decline in sheep husbandry, in this State, is largely due to the destructive work of dogs. No State in the Union surpasses Missouri in natural advantages as a sheep producing State; yet in face of this fact, and the fair prices prevailing for mutton and wool, the number of sheep in the State declined 7 per cent between the assessments of 1888 and 1889. It is to be hoped that the next Legislature of Missouri can be induced to pass some effective measure for the restraining of the pernicious dog, and thereby do the farmers of the State a practical service. The figures in the table of live-stock statistics were furnished by the county clerks of the respective counties, and were taken from the assessment books. The table is worthy of much study.

Farm Labor and Wages.—The supply of farm labor is for the most part abundant, but generally inefficient. But little labor is employed by the year, and as a rule, no provision being made for men with families, single men are employed, who are boarded in the farmers' families. With prevailing low prices of farm products, farmers do not feel able to employ much help, nor to pay as good wages as can be obtained elsewhere. This lack of steady employment and low wages results in a transient, inefficient class of farm laborers. When provision is made to hire men with families, the average rate of wages paid is better than the figures would indicate. In such cases a house and garden are usually provided, time and the use of tools and teams for cultivating and other benefits allowed, which make the monthly wages from $25 to $30.

A NEW INSECT.—One of our correspondents, Mr. I. R. Turner, of Madison county, Mo., sent to this office recently some specimens of an insect which appeared in his neighborhood last year, and which exist in large numbers this season, doing much damage to cabbage and kindred plants. It proves to be the Harlequin cabbage bug *(Strachia histrionica),* or Texas cabbage bug. It is a Southern insect, but one which the entomologist predicted some years ago would find its way north into Missouri and Illinois. It is nearly three-eights of an inch long and one-fourth of an inch broad, elliptical in form, black, yellow and white, quite gay in appearance. It is a true bug, and lives by sucking the juices of the plants. It is a relative of the common squash bug. Prof. J. W. Clark, Horticulturist of the Agricultural Experiment station, Columbia, suggests spraying the infested plants when small with an emulsion made as follows: Dissolve one quart of soft soap or one-fourth of a pound of hard soap with two quarts of boiling water. As soon as the soap is all dissolved, and while yet hot, add one pint of kerosene oil and stir violently until no oil will rise to the top. When ready to apply, stir in seven quarts of water. This is one of the best insecticides for all insects that live by sucking.

THE MONTHLY CROP REPORTS of the State Board of Agriculture are published for the farmers of the State, and an effort will be made to make them of value, not only in giving information respecting prevailing condition of crops and stock, but in conveying information of a more technical and practical character. It is desired that correspondents call upon this office for information in the line of farming of which they may be in need and all means will be exhausted to supply the need. The members of the staff of the Experiment station of the Agricultural college hold themselves in readiness at all times to answer any questions pertaining to their special fields. The papers of the State are making free use of these reports, and through them a large majority of the farmers of the State may be reached.

SUMMARY OF CROP RETURNS.

Percentage of condition and areas.	The State.... per ct.	Northeast Mo. per ct.	Northwest Mo. per ct.	Southeast Mo.. per ct.	Southwest Mo. per ct.	Central Mo.... per ct.
Wheat, per cent of condition	83	78	96	83	85	75
Wheat, per cent plowed up	05	09	01	05	04	09
Rye, per cent of condition	89	86	97	88	89	83
Oats, per cent of area sown compared with 1889	96	95	100	93	96	97
Meadows, per cent of condition	97	99	97	97	98	95
Pasture, per cent of condition	96	66	96	95	97	95
Mowing land, per cent area sown	106	104	108	165	111	104
Cotton, per cent planted May 1	39	....	....	21	62	....
Cotton, per cent usually planted May 1	73	....	....	66	78	68
Spring plowing, per cent done May 1	68	65	78	52	79	80
Spring plowing, per cent usually done May 1	78	67	74	83	86	102
Total area of spring planting (all crops together)	101	100	101	101	102	86
Apples, per cent of early	92	95	100	82	96	89
Apples, per cent of late	97	97	102	96	99	25
Peaches, per cent	22	22	21	12	28	59
Pears, per cent	70	82	82	56	73	70
Plums, per cent	74	94	78	63	70	87
Cherries, per cent	90	99	100	81	93	96
Strawberries, per cent	91	97	96	83	94	90
Raspberries, per cent	93	93	95	89	95	86
Blackberries, per cent	94	98	95	93	98	....

SUMMARY OF WAGES.

Average wages per month (without board) of farm laborers	$19 54	$21 33	$21 98	$19 13	$17 62	$18 26
Average wages per month with board	14 13	15 35	16 45	13 94	31 07	13 35
Average wages per day without board for harvest	1 34	1 43	1 36	1 32	1 26	1 36
Average wages per day with board for harvest	1 08	1 12	1 10	1 05	1 03	1 10
Average wages per day without board, other than harvesting	88	99	1 02	84	80	81
Average wages per day with board, other than harvesting	66	76	76	61	60	62

MAY, 1890.

COLUMBIA, MO., June 7, 1890.

CLIMATIC CONDITION.—As introductory to the monthly crop and meteorological report, we will briefly summarize from the weekly weather crop bulletins issued from this office during the last four weeks: For the week ending May 2, rain-fall was above the normal in the southern half of the State, and delayed corn planting. It was slightly below in the northern half. Temperature and sunshine was normal. Light frost occurred on May 2. For the week ending May 9, rain-fall, temperature and sunshine were below normal, resulting in slow growth of vegetation in all sections. The soil had become too dry in the northern part of the State, and crops were beginning to suffer.

Frost was general over the State on the 6th and 7th, but damage was slight.

For the week ending May 16, rain-fall was above the normal in Southeast Missouri and below in other sections of the State.

Temperature was much below normal, with general frosts, on the 16th, and ice in the northern part, causing injury to corn, fruits and vegetables. Crops were generally unfavorably affected.

For the week ending May 23, the rain-fall, temperature and sunshine were normal. The soil in Southeast Missouri was getting into good working condition and corn was being rapidly planted. In nearly all other sections timely rains had fallen.

For the week ending May 30, the rain-fall was above the normal in the central portion of the State and below elsewhere; the drouth prevailing in Northwest Missouri was beginning to injure crop prospects. The temperature and sunshine were normal or above, and had a good effect upon the growing corn. Wheat prospects were getting worse. The outlook for corn was only fair, taking the State as a whole.

WHEAT.—The effect of the last two more than usually abundant wheat crops in this State was an increase, last fall, of the previous year's area, a seeming reversal of the policy of a few years past, which had been to decrease the wheat acreage. Notwithstanding, however, this increased area sown, the number of acres to be harvested this season will be less than last by at least 30,000. The condition of the present season's crop is such that the yield per acre must be below the general average for the State, and considerably below the yield of the last two years.

The dry weather that has prevailed for the most part during the last month in Northwest Missouri has materially lessened the prospects in that section, where one month ago the outlook was the most promising. There has been a decline in condition in all sections of the State. Many fields, which one month ago seemed to be quite promising, are, since heading, proving to be nearly all chess. A considerable area has been plowed up since this has become known.

Other fields are so thin that they will hardly return the seed, but are allowed to stand because seeded to grass and clover.

The Hessian fly is working quite seriously in Southwest Missouri, while in Southeast Missouri the grain aphis is threatening to do some damage. There have been a few complaints of chinch-bugs, but so far no damage is reported.

OATS.—The acreage of oats is less than that of last season, because of the continuance of excessive rains in Southeast Missouri until it was too late to sow, the prevalence of the grain aphis which has utterly ruined many fields, the tow prices at which last year's crop was sold, and the tendency to decrease the grain area and seed the land to grass.

Insects in the southern part of the State and cool dry weather in the northern part make the condition of the oat crop quite poor.

MOWING LAND.—By referring to the table of summaries it will be seen that in all sections of the state there has been an increase in the acreage of clover and mowing land. This is confirmatory of what has seemed to be the case for some time, namely: that the farmers of Missouri are steadily increasing the proportion of grass land to the grain acreage. Unquestionably the policy is the correct one. There can be more stock food produced from an acre of cultivated land than from one in grass, but one hundred pounds of nutritive matter from the latter will cost less as a rule than an equal amount from the clutivated land. But with the present low prices of farm products, it is more important to produce that which can be cheaply than to try to add to an already over-crowded market. Another point of no small importance in favor of grass rather than grain crops is, that while the land is in grass, it is resting and improving; but when it is grain cropped, unless handled very carefully and skillfully, it will lose in fertility. Until prices of farm products shall advance, it will be best that as much as possible of the cultivated land be seeded to grass and clover, especially the latter.

CORN.—There is little to be said yet in regard to the corn crop. In accordance with the foregoing, there is a falling off in the acreage planted in all sections excepting Southwest Missouri, where considerable new land is being brought into use. The condition of the crop is not as favorable as could be wished, owing to the delay in planting in Southeast Missouri, and the lack of rain in the northern portion of the State. There has been some complaint of the wire-worms, mice and moles taking the seed corn before it could germinate. A number of rather uncommon insects, which will be mentioned further on, are working on the young corn in some sections.

COTTON.—The continuous rains in Southeast Missouri, the principal cotton growing section, has been disastrous to this season's crop. Planting was so greatly delayed that the acreage has been considerably decreased, and the plants thus far have a poor start.

FLAX.—Among those crops which may be regarded as special, flax is the most important in this State. It is grown to a limited extent in Northeast Missouri, but the great bulk of the crop is grown in Southwest and western Central Missouri. In the latter sections the acreage has been largely increased.

CASTOR BEANS are grown to a more limited extent in the more southern portions of the State. The acreage of this crop has also been considerably increased.

BROOM-CORN is grown to a limited extent in all sections of the State.

CREAMERIES AND CHEESE FACTORIES.—Returns from our correspondents in answer to the inquiry whether or not creameries or cheese factories existed and were in operation in their respective counties show that there are fifty-two in the State. This information was called for as a preliminary step toward calling a dairy convention, if it is deemed advisable, by the Board of Agriculture to be held at Columbia next October. That there are fifty creameries and cheese factories in Missoui may surprise many; but with over 700,000 cows in the State and natural advantages of climate, cheap stock food, good pastures and water and accessibility to markets, which should place the State in the front rank of dairy states, it is not creditable to our people that there are not two or three times the number. In the hope of arousing an interest in this line of agriculture, it is proposed that the Board of Agriculture hold a dairy convention or dairy institute. If the scheme is carried out, a full line of the best modern dairy apparatus will be secured, placed in position and operated during the convention by experts, who will go through the actual process of butter and cheese-making. All the facilities of the Agricultural college and Agricultural Experiment station will be available for making the work of illustration and instruction comple. In addition to those of the college and station, expert dairymen, butter and cheese makers, dairy stock breeders, dealers in dairy products, etc., will be secured to address the convention.

As a means of determining whether the holding of such a convention is desired by the farmers of the State, correspondents and others who are interested are requested to communicate with this office in reference to the proposition.

INJURIOUS INSECTS.—Specimens of a number of insects which had been found working on different crops have been sent to this office during the past month. They were referred to Miss M. E. Murtfeldt, of Kirkwood, Mo., for identification.

The first lot was from Mr. Albert Falcon, of Appleton City, Mo., who wrote that they were doing considerable damage to his corn. Last season they worked in his garden, but were then easily kept in check by using kerosene emulsion.

Miss Murtfeldt speaks of the insect as follows:

> The specimens were identified as the brassy or bronzy Flea beetle (*Chae toenema pulicaria*, Cr.) a very small bronzy-brown, jumping species, quite a general feeder, but some years especially destructive to young corn, perforating the shoots with innumerable holes. Dusting with wood ashes is one of the most practicable remedies, but even this would be quite an addition to the cost of culture of a large field of corn. If the season is favorable, the corn will recover after the beetles have disappeared, as they will do shortly.

Mr. S. W. Gilbert, of Thayer, Mo., sent specimens of a large and beautiful curculio, which Miss Murtfeldt calls the Imbricated Snout beetle (*Epicaerus imbricatus*, Say). It has been known to do considerable damage to fruit trees and some sorts of garden vegetables by gnawing the fruits and leaves. The same means of fighting the plum curculio will probably be effective against this.

Hon. R. W. Mueller, of Augusta, Mo., wrote as follows:

> With this I send a box of specimens of a plant louse that is destroying the oats in this part of St. Charles county. They are also attacking the wheat, but so far without visible damage.

This is the insect that is doing so much damage to the oats crop in Southeast Missouri, and which is referred to elsewhere.

Still another letter is as follows:

MT. LEONARD, MO., May 24, 1890.

LEVI CHUBBUCK, Secretary, Columbia, Mo.:

DEAR SIR—I have mailed you a box of beetles, or bugs, for the purpose of ascertaining their name. Having never seen a description of them, I am somewhat anxious to know their nature and results of their doings. I have planted 240 acres of corn on sod (timothy and clover) broken this spring, and I had a fine stand until three days since, when I first noticed the bugs in great numbers sucking the stalks and perforating the blades of corn, after which it dies. In catching them I found quite a number of lice or parasites on the most of them. Did not know whether they were the young or not. They were somewhat the shape of the bug and transparent in color.

Yours, etc.,

J. R. THOMAS.

Miss Murtfeldt replies to the two letters, as follows:

> Yours of the 28th with box of specimens has only just reached me. The plant lice on oats from Mr. R. W. Mueller are undoubtedly the Grain Aphis (*Siphonophora avenae*), the same species that was so destructive to small grain in certain localities in the West last year. There is really no artificial remedy that it would be practicable to employ. But this insect has a host of natural foes, including, according to Prof. Riley, nine true parasites, three Syrphus flies, two Lacewings and several Ladybird beetles. These generally appear in sufficient numbers to prevent more than a moderate shrinkage of the crops.

The curculionid beetle sent by Mr. J. R. Thomas, of Mt. Leonard, Mo., injuring young corn, is one of the Corn "Bill bugs" (*Sphenophorus Sculptilis*), a wel known and serious pest on corn, especially on that planted on sod. The only remedy that has been suggested is a slight dusting of Paris green as soon as possible after the corn appears. This species does not breed in the corn plant, and commits all its depredations in its perfect state. I could not find any traces of the mites or parasites on these Bill bugs to which your correspondent calls attention. They were certainly not the young.

MARY E. MURTFELDT.

SUMMARY OF RETURNS.

Percentage condition and acres of various crops.	State.		NE. Mo.		NW.Mo.		SE. Mo.		SW.Mo.		Cen. Mo.	
	Acreage...	Condition.	Acreage...	Condition.	Acreage...	Condition	Acreage .	Condition.	Acreage...	Condition.	Acreage...	Condition.
Wheat	98	78	100	73	97	88	95	77	101	82	98	73
Rye	96	91	98	92	91	87	96	90	100	94	96	91
Oats	95	89	95	88	102	82	90	79	97	97	97	89
Clover	106	96	104	96	101	90	106	98	113	99	106	96
Spring pasture	...	87	....	95	....	86	...	99	....	98	....	96
Cotton	90	73	..	....	..	....	86	74	105	70	90	73
Corn	98	89	100	93	98	92	92	71	103	89	98	89
Mowing land	102	96	97	96	100	84	102	100	108	99	102	96
Flax	124	97	99	98	....	....	....	....	144	98	124	97
Castor beans	110	91	....	....	...	....	80	80	116	94	110	91
Broom corn	99	96	103	99	100	93	98	90	93	93	99	96
Tobacco	89	93	89	97	83	70	88	86	94	96	89	93
Potatoes	96	96	98	96	98	96	91	94	99	90	96	96
Sorghum	98	93	95	94	94	95	90	84	103	96	98	96
Apples	....	87	....	97	....	85	....	74	....	96	....	87
Peaches	....	26	....	25	...	29	....	25	...	32	....	26
Strawberries	98	96	97	96	91	98	98	85	102	99	98	96
Raspberries	100	98	101	97	99	97	100	96	102	100	100	98
Blackberries	100	100	97	97	102	98	99	102	102	102	100	100
Creameries and cheese factories, No. of	....	52	....	6	....	15	....	....	5	18	....	8

JUNE, 1890.

COLUMBIA, July 5, 1890.

CLIMATIC CONDITIONS prevailing during the month: For the week ending June 6 much needed rain fell in the northeastern section; elsewhere the rainfall was below the normal. In the eastern half of the State the ground was generally too dry, while in the western half it was in good condition. Temperature and sunshine were above the normal, causing the corn to take a good start.

For the week ending June 13 the rain-fall was slightly below the normal in the southern and slightly above in the northern and middle sections. Temperature and sunshine were normal over the State.

For the week ending June 20 the rain-fall was below the normal in Southeast Missouri, and in some of the central counties; elsewhere it was above the normal. Temperature was above the normal over the entire State. Sunshine was above in Southeast Missouri and normal elsewhere.

For the week ending June 27 the rainfall was below the normal over the entire State. Light local rains fell during the week in portions of the western and northwestern sections, but all sections are needing rain. A local drouth has prevailed in parts of Andrew, DeKalb, Gentry and Nodaway counties since April 1. The weather has been unusually warm and clear, making a fine week for harvesting.

WHEAT.—With the generally prevailing clear and warm weather of the last two weeks, wheat ripened rapidly, and the harvesting was pushed. By July 1 nearly the entire crop was in the shock, and in the more southern portions of the State threshing is well under way. Reports of yields per acre in bushels are as yet too meager to be able to state definitely what the average yield will be. The closer examination allowed by harvesting, however, reveals clearly that the crop was, as a rule, very thin on the ground, and badly mixed with chess, but that it has generally headed and filled well, and that the grain is of an unusually fine quality. The prospect is favorable for securing the crop in excellent condition, thus securing a high grade of wheat for market.

OATS.—Never in the history of the State has there been so poor an oat crop harvested as the present one. The Grain Aphis (*Siphonophora avenæ*) or Texas Oat Louse, referred to in the last crop report, has spread over all that portion of the State east and south of a line drawn from the northeast to the southwest corner, and in all that region has done an enormous amount of damage, completely ruining a large portion of the crop. The earliest sown oats were less damaged than those sown later.

Mr. J. R. Adams, of Iron county, writes: "I sowed my oats March 25th, turned them under with a plow. They are a little thin on the ground, but the aphis has not hurt them much, and they will average 80 per cent, while the crop of my township will not be over 10 per cent of a full crop."

In other sections of the State not ravaged by the Aphis, the oats are shorter than usual.

CORN.—Owing to the long continued and excessive spring rains in Southeast Missouri, much of the corn in that section was not planted until June. Though late in getting started it grew rapidly at first, but the absence of rain lately is retarding the growth. Generally over the State the corn is small for the season, but has a good color, has been growing fast, and the fields are free of weeds and well cultivated. Insects of various kinds have been working on the crop in different localities, but so far the damage has not been extensive, although the Grain Aphis threatened some harm.

MOWING LAND AND PASTURES.—Clover will yield a fair crop generally, but timothy is short and light, owing in a measure, it is thought by some, to the lack of freezing weather last winter to act beneficially on the soil. The favorable weather for haying now prevailing will insure a good quality of hay.

Pastures are being shortened by the generally prevailing dry weather.

FRUITS.—The effect of the late spring frosts is seen in the condi- of apples and peaches. Complaints are frequent that the apples are dropping badly. Grapes are rotting considerably in some localities.

NOTES ON INSECTS.—Miss M. E. Murtfeldt, of Kirkwood, Mo., on whom we have called so frequently for entomological information for the correspondents of the Board, kindly prepared the following notes for this report:

Mr. J. Ed. Chubbuck, of Kiddor, Mo , writes: ''I send a few specimens of a worm that is doing much damage to the potato vines in this section of the country. The worm is found in the center of the stalk, working its way upward from the ground, destroying all the heart of the stalk as it proceeds. The vine soon begins to die, the end leaves dying first, and so on down to the ground.

''A considerable amount of damage has already been done by this worm, and should it continue it will destroy a large part of the crop." * * * *

The insect enclosed is the common ''Stalk-borer" (*Gortynanitela* Guen.) It has long been known as an occasional enemy to the potato, but its appearance in such numbers as to severely injure the crops is rather unusual. This insect is one of the most difficult to manage of all our farm and garden pests. It requires about two months for the larva to attain its growth, and in the meantime it bores a vast number of stalks, changing from one to another, and often crawling considerable distances on the ground.

The affected stalk is easily noted by the withered tips, and the most reliable means of fighting the pest is to pull these out as soon as observed and destroy them by burning. This would be a somewhat laborious task in a large field, but if taken in time will save the crop. Small children can be taught to look for the diseased stalks, and are equal to the work of pulling them out and destroying them.

The same worm has also been sent me by Mr. Albert Falcon, of Appleton City, who found it boring the stalks of young corn, and, in that section of the country, completing the destructive work begun by flea beetles and other pests on that important crop.

I will give in a future number a more complete history of this insect and the result of some experiments which I propose to make in methods of extermination.

Mr. S. W. Gilbert, of Thayer, Mo., writes as follows:

''I send to-day a small tomato and a worm which is doing a great damage to the first clusters of early varieties of this fruit.

"One of these worms usually bores from one to three holes in each tomato, and eats out the whole of the inside. The pest will not leave a cluster until it has ruined every one. Where the fruit is simply gnawed into, it rots before ripening. Is there any practical remedy? I also enclose some specimens of some beautiful little green-backed bugs, which are swarming by millions on some parts of my place. They are on one or two kinds of weeds that they seem to be especially fond of. Also dock is eaten very readily by them. There are a good many in my oats, but I have not noticed them doing any great injury to growing crops or weeds. What are they, and is there any harm in them?"

The green, slightly roughened worm is the larva of a beautiful green and white moth of the Noctuid family, scientifically known as *Chloridea rhexia*. Like the "Boll worm," alias the "Corn worm," alias the "Tomato worm," this larva is very variable in its coloring, sometimes imitating closely the substance upon which it feeds. Its prevailing habit is to bore into certain fruits, and I have chiefly bred it from the inflated calyx which enclose the fruit of the ground cherry (*Rhysalis viscosa*), in which it secretes itself, and bores into or entirely devours the fruit. It is, however, also an external feeder, and I had occasion a year or two ago to give some account of it as a "red worm," which had proved, during that season, very injurious to the blossoms of geranium.

I think that while the tomatoes are small there could be no danger in dusting them with air-slaked lime or refuse flour in which a little Paris green or London purple was mixed, perhaps a scant teaspoonful to a quart of the lime or flour. This should be washed off, after a few days, by a thorough watering, unless nature does the work in the mean time by a heavy shower. The only other remedy is to pick off the worms by hand—a somewhat tedious process if the tomato plantation is large.

The small metallic blue or greenish beetles are *Colaspistritis*—a very pretty species, which probably cuts the leaves of shrubbery and herbaceous vegetation to some extent, but is not noticeably injurious. The fact of its swarming so numerously in certain locations would indicate that it breeds probably on the roots of some plant abundant in that particular spot. I have not yet investigated its life history.

MARY E. MURTFELDT.

SUMMARY OF RETURNS.

	State.		NE. Mo.		NW.Mo.		SE. Mo.		SW.Mo		Cen. Mo.	
	Acreage...	Condition..	Acreage...	Condition..	Acreage...	Condition..	Acreage...	Condition..	Acreage...	Condition..	Acreage...	Condition..
Corn	....	92	....	99	...	93	....	84	....	93	..	92
Wheat	....	75	....	74	....	89	....	73	....	79	....	61
Rye	....	90	....	91	....	90	....	88	....	89	....	87
Oats	....	47	....	63	....	70	....	25	....	54	....	30
Clover	....	92	....	93	....	79	...	95	....	97	....	92
Timothy	....	87	....	90	....	70	....	92	...	93	....	90
Pasture	..	91	...	95	..	78	..	92	....	95	....	95
Potatoes, Irish	96	91	99	98	98	84	86	84	98	97	97	91
Potatoes, sweet	98	92	100	98	97	88	93	88	95	97	95	90
Beans	99	95	100	96	99	92	95	90	98	99	98	93
Sorghum	97	91	98	97	99	90	88	85	99	93	97	93
Tobacco	87	90	92	91	94	93	94	87	93	94	82	88
Cotton	....	100	....	..	...	...	....	98	....	108	...	..
Apples	....	79	...	83	....	79	....	67	....	82	.. .	85
Peaches	....	20	....	24	....	21	....	20	....	18	....	17
Grapes	....	87	....	87	....	77	....	88	....	90	...	90

JULY, 1890.

COLUMBIA, MO., August 7, 1890.

CLIMATIC CONDITIONS.—For the week ending July 4, the rainfall was below the normal. Except light local showers, no rain fell during the week, and the bad effect of a drouth was beginning to be felt throughout the State. Every county reported rain needed for corn and other growing crops. In Ste. Genevieve, Mississippi, Bollinger, Pulaski, Audrain and Gentry counties the corn was reported badly curled, some of it dead.

Temperature and sunshine were above the normal. During the first part of the week the temperature was unusually high, but during the last two days it was below the normal. The week was favorable for completing the wheat harvest, and for harvesting the oats and hay in the southern portion of the State, but in the northern portion where these crops were yet growing they were injured by the hot, dry weather.

For the week ending July 11, the rainfall was below the normal. Local showers occurred throughout the eastern half of the State on the 8th, but elsewhere scarcely any rain had fallen. Lewis and St. Clair counties reported no rain for four weeks; Caldwell, Cole and Christian none for three weeks, and Dallas none for two weeks. Stock water was getting scarce, and in some sections of the northwest stock had to be driven several miles for water. At Maud, Shelby county, the heaviest rain of the season fell on the 8th, doing considerable damage to corn. Temperature and sunshine were much above the normal. The week was very warm and dry, and while favorable for harvesting the oats and hay, it was very injurious to corn, pastures and vegetables. The condition of corn was reported at 60 per cent in Iron county, 75 per cent in Bates, 50 per cent in Gasconade. Correspondents in many other counties stated that a few more days of drouth would ruin the crop.

For the week ending July 18 the rainfall was normal. The drouth that had prevailed throughout the State for the past month was broken. Although the rains were local in character, all sections and nearly all localities had good rains. The temperature and sunshine were slightly above the normal. The corn crop had by this time been seriously injured by the drouth, but the rains of the past week greatly improved it, and in some sections the conditions were still such that with future rains a fair crop would be made. The hay crop has been harvested under favorable conditions. While the yield is reported light, the quality is fine. The potato crop is reported poor in all parts of the State. Garden vegetables have been almost destroyed by the drouth. Pastures were materially improved by the rains.

For the week ending July 25 the rainfall was normal for the State. There were, however, some localities needing rain. Crawford, Dent, Pulaski, Warren, Lewis, Marion and Shelby counties reported the crops suffering from drouth. The temperature and sunshine were normal for the week. Some damage was done to the wheat and oats in the shock, and where the harvesting had not been completed hay and oats were injured to some extent by the rain. Corn, late potatoes and pastures were greatly benefited and took on new life. The following estimates of the condition of the corn crop were given by the correspondents in the counties named: Buchanan, good; Boone, 50 per cent; Carroll, 80 per cent; Cass, 80 per cent; Chariton, fine; Clay, 50 per cent; Dade, 60 per cent; DeKalb, 70 per cent; Iron, average; Moniteau, 50 per cent; Polk, 70 per cent; St. Clair, 50 per cent; Taney, fair; Vernon, 70 per cent, and Washington, 70 per cent. The drouth which began in June and extended until the middle of July, together with the excessive heat, was very injurious to all crops, so much so that the rains of the second and third weeks of July and the lower temperature accompanying were not sufficient to overcome the injury done. The last week of the month is one of very limited rainfall, high temperature and injurious effect on crops.

WHEAT.—Returns thus far received indicate an average yield of nine bushels of wheat to the acre for the State, or a total yield of about 14,000,000 bushels. The quality of the grain is such as has been rarely equaled in the State.

THE CORN CROP has suffered seriously from the dry weather, particularly the early planted that was not well cultivated. Many such fields are a total failure. The quite general rains that fell about the middle of July had a very beneficial effect on the late planted portion of the crop, but even with the most favorable conditions prevailing from now to the maturing of the crop, it must necessarily be short.

OATS.—Information received up to date from all sources confirms former estimated damage done to the oat crop by the grain aphis. A very large acreage of the crop was not harvested, while much of that which was will not return the seed sown. Much of the grain is proving to be light in weight.

BUCKWHEAT.—The drouth has had the effect of materially reducing the acreage of buckwheat, and that sown does not show a good condition.

POTATOES.—The crop of early potatoes is short throughout the State, but the conditions are more favorable for the late planted.

TOBACCO has suffered seriously from unfavorable conditions prevailing from before the planting season. The crop will be short in acreage and light in yield.

HAY has been secured in an unusually fine condition, owing to the absence of rain during harvesting, but the yield is light.

PASTURES had become much dried up when the rains fell about the middle of July, so much so that farmers were feeding their stock.

FLAX, Although limited principally to Southwest Missouri, is grown quite extensively in that section of the State. The area this season will be not far from 45,000 acres, which, with an estimated yield of nine bushels per acre, will give a total crop of 405,000 bushels.

FRUITS.—Apples, peaches and grapes still promise poorly, as a result of the late spring frosts and the hot, dry weather for the summer. Only a small crop will be secured.

INSECT NOTES.—The following "Notes" were kindly prepared for this report by Miss M. E. Murtfeldt of Kirkwood, Missouri.

Under date of July 1st Mr. Henry von Thun writes:

MR. LEVI CHUBBUCK, *Secretary State Board of Agriculture:*

DEAR SIR: I received your letter concerning the worm working on wheat. The wheat is all ripe now and the worms have disappeared. They were of a brown color and about the size of a chinch bug when grown or a little longer. They cut into the wheat stalks just above the ground and work up to the first or second joint. Some fields were half killed, but most of them were hurt but little. Mr. Henry Glahon, of Hager's Grove, Shelby county, had 180 acres of wheat which he had to cut before it was ripe to save any of it.

As there are several worms which bore the stalk of wheat, it is impossible to determine with certainty to which species our correspondent refers. From the fact, however, that he was able to perceive the place where the worms had cut into the stalk, it is tolerably safe to infer that the "stalk-borer" (*Gortyna nitela* Guen.) was at least one of the depredators. When full grown this worm is nearly one and one-quarter inches in length, and one-fifth inch in diameter, and it is probable that it never matures in wheat, altough so often reported as boring into it. A small proportion of these worms would probably be able, after leaving the wheat, to find their way into corn fields or other succulent crops, or to the stalks of weeds bordering the wheat fields, and in this way complete their growth and transformations. The larger number would, however, be killed by the cutting of the grain before they were half grown. It is one of the insects for which the most available remedy is the cutting and burning of the plants within which it works.

About the first of July I received from Mr. S. W. Gilbert, of Thayer, Mo., a box containing full-grown specimens of the larvæ known as the Red-humped Apple-tree Caterpillars (*Edemasia concinna* Sm. & Abb.) They were found on young apple trees, and Mr. Gilbert remarks that "a dozen of them will eat all the foliage of a one-year-old tree in a few days."

This insect is gregarious in its habits and consequently more easily exterminated than many species. In Mr. Gilbert's latitude the caterpillars are hatched, probably, early in June, and begin feeding on the green tissue on the under side of the leaf, but as they develop they devour the entire substance of the foliage. The body is stout, with a considerable hump on the fourth segment from which it tapers backward. The eleventh joint is also humped, and the hinder part of the body is held in an elevated position. The head and humps are of a coral red color, while the remainder of the surface is striped, longitudinally, in fine lines of black, yellow and white. When touched the caterpillars discharge a transparent fluid, having a disagreeable acid smell. This is supposed to protect them against the attacks of birds and cannibal insects. When full grown they desert the tree and change to pupæ concealed under fallen leaves and rubbish on the surface of the ground. The moths of the early brood emerge about the last of July, and the second brood of caterpillars may be looked for in August, or early in September. This brood hibernates in the pupa state, giving forth the moths early in the spring.

As these caterpillars feed in company, it is not difficult to keep them in check on small trees, by cutting off the branch on which they are feeding, or by jarring them to the ground and crushing them. A slight spraying of the foliage near them with some arsenicus solution would also speedily destroy them.

On July 22d Mr. Gilbert, also, sent a lot of newly hatched larvæ of what is erroneously called the *Fall* Webworm (*Hyphantria cunæ*), evidently of the second brood. The nests of this insect should be destroyed wherever found. It is capable of doing great damage to both orchard and shade trees, as it is a very general feeder. It has a number of parasites, and is preyed upon by various carnivorous beetles.

MISS MARY MURTFELDT—*Dear Madam:*

I sent you a single beetle yesterday, taken from his burrow in a young apple. I have noticed his tracks in apples for years, similar to but quite distinct from that of the Codlin moth. Have found several this year, but never could find the culprit that made them till this one. Possibly he is not guilty, and might even have been devouring our real enemy, the Codlin moth, and if so it would be quite interesting to know it.

I can find nothing in Saunders resembling him.

Yours truly,

Kirksville, Mo., July 6, '90. CHARLES PATTERSON.

Enclosed was a small specimen of the Banded Ips (*Ips jasciatus*, Oliv.,) a shining black beetle about one-fourth of an inch in length, with four interrupted orange bands crossing the wing covers. While it is not impossible that this species may burrow into sound fruit in the manner described by Mr. Patterson, it would be a new fact in its history and a very interesting one. It has quite often been found in fruit that had been tunneled by other insects, and it was in such cases supposed to have been attracted by the odor of decay, as it belongs to a group of insects that are, to a certain extent, scavengers. It is also allied to a species manifesting cannibal propensities, and, as Mr. Patterson suggests, it may have entered the apple in search of the true borer. I should be very glad of living specimens, in order to make from them a more careful study of its habits.

TABLE OF SUMMARIES.

August 1, 1890.	State.	N. E. Mo.	N. W. Mo.	S. E. Mo.	S. W. Mo	Cen. Mo.
Corn, average condition	.72	.72	.66	.67	.80	.67
Oats, " "	.46	.55	.70	.20	.56	.34
Buckwheat—						
Acreage compared with 1889	.87	.78	.80	.86	95	.97
Average condition	.75	.79	.75	.67	.83	.68
Potatoes—						
Average condition	.52	.49	.50	.44	.67	.52
Sweet	.70	.73	.76	.61	.79	.62
Tobacco, average condition	.68	.68	.73	.62	.82	.69
Hay—						
Timothy, average condition	.77	.80	.72	.80	.86	.80
Clover, product comp. with full crop	.78	.78	.70	.77	.86	.78
Quality of clover	.88	.88	.89	.87	.90	.87
Pasture, average condition	.65	.65	.60	.60	.78	.61
Cotton, " "	.83	....	......	.75	102	.50
Sorghum, " "	.75	.74	.76	.70	.86	.71
Apples, " "	.60	.64	.55	.53	.67	.61
Peaches. " "	.27	.36	.22	.19	.29	.30
Grapes, " "	.75	.82	.67	.69	.80	.74
Wheat, bushels per acre	9	10	12	9	10	8
Rye, " "	10	11	15	10	9	8
Oats, " "	14	10	23	7	20	8
Flax, " "	9	8	6	.....	9	9
Clover, tons, "	1 5	1 33	1.25	1.50	1.50	1.50
Timothy, tons "	1.25	1.13	1.00	1.33	1.25	1.35

AUGUST, 1890.

COLUMBIA, Mo., Sept. 5, 1890.

CLIMATIC CONDITIONS.—During the month of August the climatic conditions were generally quite favorable for all growing crops. The rain-fall varied from 3 inches above the normal in the western portion of the State and 1½ inches in the southern to 1¼ inches below the normal in the northeast section. A considerable area in Northeast Missouri, including the counties of Lewis, Marion, Shelby, Macon and Monroe, and a more limited area in southeastern central Missouri, including the counties of Maries, Phelps and Pulaski, have suffered severely from lack of rain. Up to the end of August there was still a deficiency of rain-fall, and the outlook for crops was discouraging in those sections. In all other sections there has been marked and general improvement in crop conditions.

The temperature for the month was about three degrees below the normal for the State.

CORN.—During the month there has been an improvement in the condition of the corn crop of two points for the State. This, however, does not indicate fully the improvement that has been made. In the sections containing the counties before mentioned as having a deficiency of rainfall, there has been a decline in the condition of the crop, the per cent being in both sections below 70, while in Northwest Missouri, our leading corn-producing section, there has been a gain of ten points. Southwest Missouri, which stands next to the northwest section in the amount of corn raised, has advanced one point, showing a condition of 81 per cent, the best in the State.

The condition of the crop where it has not reached maturity is improving, and unless an unusually early frost catches it there will be more than three-fourths of a full average yield, while in a number of our best corn counties nearly or quite a full crop will be obtained.

One thing has been clearly demonstrated by the season, namely, the remarkable capability of the Missouri soil to withstand drouth. Wherever the soil has not been unduly exhausted by continued cropping and improper culture, a fair crop of corn has been obtained. We have, however, much to learn concerning how to ward off and overcome the effects of drouth. A discontinuance of the use of the ordinary two-horse deep-running cultivator would result in an increase in the corn product in the State in seasons like the present. One of our correspondents, whom we know to be one of the best farmers in the State, says: "Corn was very much injured the last time it was worked by deep cultivation and root cutting. Many farmers have become convinced of the fact, and it is to be hoped it will be a valuable lesson in the future."

WHEAT.—A final examination of the wheat crop shows that it was somewhat better than was indicated in the July report. The percentage condition is 81, which means, placing the full average yield at 12 bushels, a yield this season of 9.6 bushels per acre. But with the reduced area sown to wheat for a few years past, and the rotation of crops, the farmers of Missouri have undoubtedly raised the yearly average yield per acre at least one-third of a bushel. The yield of the season's crop would then be nearly 10 bushels per acre, or a total of 15,260,000 bushels.

The quality of the wheat is remarkably fine.

The yield per acre in bushels, as given in the table ot summaries, was obtained by taking threshing machine returns, and is too high because of not including considerable areas not harvested. Conditions have been favorable for plowing for the next crop, and the work is well under way. The indications are that an increased acreage will be sown.

OATS.—While the threshing machine showed that the oat crop was better than expected, it is still to be recorded as the poorest since crop reports have been made in the State. This is chargeable in large part to the grain aphis, for in sections not ravaged by it a fair crop was secured, notwithstanding the effects of the drouth.

BUCKWHEAT has shown an improvement in condition as the result of the recent rains, and if frost holds off a fine crop will be secured.

POTATOES show a falling off in all sections of the State. It is evident that the rains came too late to help the early crop, and digging shows a poorer yield than was anticipated. Unless the late plantings yield well, the product will be very small. Sweet potatoes are more promising.

APPLES have fallen off in condition very materially, and as a result of the late spring freeze, drouth and prevalence of Codlin moth, the crop will be quite light in all sections of the State. There will, however, be a considerable surplus of fruit for sale, and at very remunerative prices, because of the scarcity in other sections.

SPECIAL CROPS.—Many letters come to this office inquiring in what sections of the State such special crops as pumpkins, pickling vegetables, fruits, flax-seed, hemp, castor beans, tobacco, potatoes, etc., are grown in quantities sufficient for marketing. If the Board of Agriculture could be put in possession of such information by the growers or our regular correspondents, buyers could be informed where to go, and the producers would be benefited.

LIVE STOCK.—Stock-hogs have decreased in numbers because of the better prices which prevailed during the past season for this class of stock than for other classes, causing them to be sold more freely and closely, followed by a decline in price and a prospective short crop of corn, which would command too high a price to be fed profitably. As a result, stock-hogs have been neglected or gotten rid of, and those on hand are not in the average condition. In timber sections a very heavy mast is reported, and the condition of hogs in those sections is improving.

Stock cattle also seem to be scarce in all sections of the State, consequent upon the low prices that have prevailed for a number of years for beef cattle. The extended drouth cut pastures and water short, and the condition of grazing stock is low; but since the rains grass has started well and promises an abundance of fall feed. Stock is now doing well.

The farmers of Missouri would find at least a partial adoption of the soiling system of summer feeding profitable. A few acres of rich land near the barn and feed lots sown to a succession of such crops as rye, oats, millet and sorghum, would give a supply of food that would supplement pastures in time of drouth, and often save stock from losing flesh, something which a strong effort should be made to do if profit is to be expected from any class of stock. Such a supply of food is especially valuable for milch cows, even when pasturage is abundant.

ANIMAL DISEASES.—As a rule, stock is and has been comparatively free from diseases. Texas fever has been less prevalent than usual. There is some complaint of hog cholera, and lately a few cases of black-leg have been reported in the central part of the State. It is quite probable that there will be frequent outbreaks of the latter disease this fall because of the luxuriant growth of pasture, which will cause the calves and yearlings to lay on flesh rapidly. The disease is one that attacks the thriftiest of the young cattle in districts where the germs exist.

In this connection we will call attention to the bulletin on black-leg, by Dr. Paul Paquin, State Veterinarian, published by the Agricultural Experiment station. It is republished in 22d Annual Report of the Board of Agriculture, now ready for distribution; 14,000 copies of this report are printed and distributed free to the farmers of the State. It comprises 500 pages and is filled with agricultural statistics and information of value to progressive farmers. This volume is especially valuable in giving information to home-seekers concerning the resources of Missouri.

A NEW CATTLE DISEASE.—Dr. Paquin, State Veterinarian, prepared an article on a disease that has broken out among the cattle in some of the counties of Missouri, but it was received too late for insertion in this report. The malady is supposed by some to be the European foot and mouth disease, but the doctor says it is not. He is investigating the matter, and will shortly be able to speak definitely. Even if it were, he says there is no occasion for undue alarm, as it is not a particularly fatal disease, the death rate scarcely rising to 10 per cent in the most serious outbreaks, while ordinarily it is only one-half per cent. The article intended for this report, which describes the disease and mode of treatment, will be given to the press; but in the meantime it is urged that statements and rumors calculated to alarm stockmen should be discredited.

VETERINARY SCHOLARSHIP.—Last season the N. Y. College of Veterinary Surgeons placed at the disposal of the Board of Agriculture a free scholarship to be awarded to some worthy young man of limited means. Mr. John D. Deal, of Charleston, Mo., received the appointment and attended the institution. The offer is renewed for another scholarship, as per the following:

NEW YORK COLLEGE OF VETERINARY SURGEONS,
332 East 27th Street.
NEW YORK, August 18, '90.

To the Secretary of the State Board of Agriculture of Missouri:

SIR—I am authorized by the Trustees and, Faculty to offer your honorable Board a free scholarship in the institution for the benefit of some worthy young man of limited means.

He will be required to pay the matriculation and dissecting fees at the beginning of each term, and the graduation fee when he presents himself for final examination.

Respectfully yours,
HARRY D. GILL, V. S., Sec'y of the Faculty.

Applications for the scholarship should be made to the Secretary of the State Board of Agriculture, Columbia, Mo.

FARMERS' MEETINGS.—A circular letter in reference to a series of farmers' meetings recently sent out to managers of butter and cheese factories met with encouraging responses from a large number of points. Already there are more calls for meetings on file than can be held with our present limited funds. A series of meetings will shortly be arranged and dates fixed. We hope to begin the series about Oct. 20. Dairying will be a leading subject for discussion at these meetings.

SEPTEMBER, 1890.

COLUMBIA, MO., Oct. 4, 1890.

NORTHEAST MISSOURI.

A drouth has prevailed in a large part of the northeast section of the State during nearly the entire season, resulting in short crops of all kinds, excepting wheat. It has been most prolonged in the counties of Marion, Lewis, Knox, Shelby and Macon. Many of the correspondents report stock water scarce and poor, the land dry and difficult to prepare for fall seeding.

A large acreage of wheat is being sown. The short crop of hay and forage crop will result in more than the usual amount of wheat straw and corn fodder being used for stock food.

Frost on the 13th of September cut the corn fodder considerably and injured the late corn somewhat.

Cattle have been troubled with a form of foot and mouth disease, but the cases soon recover.

NORTHWEST MISSOURI.

Conditions during the month just past have been favorable in the northwest section, although a little too dry in some counties. Frost on the 13th cut tobacco and tender vines badly, and killed the corn fodder, but did little injury to the grain.

Ground is in excellent condition for fall seeding, and a large acreage of wheat is being sown.

Pasturage is good and stock healthful.

SOUTHEAST MISSOURI.

Considerable rain is falling in Southeast Missouri, making the soil too wet in many counties for fall seeding. A large acreage of wheat will be sown if the rains cease in time. The farmers in that section prefer sowing late so as to avoid the Hessian fly.

Rains have greatly improved the prospects for corn, and if frosts hold off there will be a fair crop. There is some complaint of the corn worm.

Early potatoes were a very light crop, but the later plantings promise much better.

Considerable hog cholera exists, and some cases of foot and mouth affection among cattle.

SOUTHWEST MISSOURI.

Complaint is almost universal from correspondents in Southwest Missouri of too much rain during the last few weeks. A good corn crop is being injured by the excess of rain, causing it to rot in the shock and on the stalk.

Wheat seeding is being delayed. Land that was plowed early is overgrown with weeds and grass, and much of it will have to be replowed before the wheat can be sown.

A good crop of sorghum has been secured.

Hog cholera exists to a wide extent in some counties, and there is some complaint of pink-eye in cattle.

CENTRAL MISSOURI.

In the northern part of the central section, favorable conditions have prevailed during the last thirty days. Soil for the fall seeding is in good condition, and a large acreage of wheat is being sown.

In the southern portion of the section there has been an excess of rain, and seeding is being delayed.

Sorghum, late crops and pastures are fine.

Pink-eye and the foot and mouth affection have prevailed among cattle and cholera among hogs. A heavy loss of sheep by dogs is reported from Callaway county.

TABLE OF ESTIMATES.

The following table shows the average of the estimates of the correspondents in different counties of the State by sections:

TABLE OF SUMMARIES.

	State.	N. E. Mo	N. W. Mo.	S. E. Mo.	S. W. Mo.	Cen. Mo.
Wheat—Average yield per acre in bushels...	11.6	12	16	9	11	10
Wheat—Average quality, 100 representing high medium grade..................	97	94	100	90	94	96
Rye—Average yield per acre in bushels......	12	14	16	14	11	11
Rye—Average quality......................	94	95	98	89	93	92
Oats—Average yield per acre in bushels.....	17	18	28	6	18	14
Oats—Average quality......................	73	77	92	58	74	66
Buckwheat—Average condition Oct. 1.......	83	78	92	89	90	83
Corn—Average condition Oct. 1.............	78	73	85	74	83	81
Potatoes, Irish—Average condition Oct. 1...	51	48	51	56	50	49
Potatoes, sweet—Average condition Oct. 1...	78	78	73	77	85	79
Tobacco—Average condition Oct. 1..........	77	74	57	82	83	80
Sorghum—Average condition Oct. 1.........	86	80	88	84	94	88
Cotton—Average condition Oct. 1............	80	......	......	82	84	......
Cotton—Prospective yield in hundredths of a bale per acre..............................	61	......	......	60	68	......
Condition of land on which fall wheat is being sown..................................	92	94	101	94	75	95
Per cent of crop already sown.............	54	75	79	42	35	47
Total area compared with 1889..............	124	112	153	124	119	108
Per cent of wheat straw fed................	78	62	82	69	88	94

NORTHEAST.

Counties.	Wheat.		Rye.		Oats.		Buckwheat—condition ...	Corn—condition	Potat's.		Tobacco—condition......	Sorghum—condition......	Cotton.		Wheat.			Wheat straw to be fed .....
	Y'ld per acre in bu.	Quality of grain ..	Y'ld per acre in bu.	Quality of grain ..	Y'ld per acre in bu	Quality of grain ..			Irish—condition...	Sweet—condition ..			Average condition.	Prospect yield	Soil—condition...	Per cent of sown..	Area com. 1889...	
Adair	12	100	11	100	25	90	100	100	100	100	100	100	...	....	100	...	109	50
Andrain	11	93	..	...	17	92	..	83	27	65	...	77	...	....	..	95	125	50
Clark	13	100	12	100	18	72	75	95	75	87	.	90	...	....	100	80	120	55
Knox	14	100	13	98	18	81	60	89	43	76	95	83	..	....	100	95	120	85
Linn	11	100	11	97	24	96	...	60	42	88	54	93	....	...	95	85	125	80
Lewis	11	90	10	85	13	65	..	45	42	50	..	70	....	....	75	80	100	85
Lincoln	10	90	10	90	10	20	.	50	25	75	25	60	....	...	100	100	90	50
Macon	7	100	25	100	20	75	50	50	.	75	...	75	....	....	110	90	150	....
Marion	10	95	15	100	20	75	..	70	25	65	...	60	....	....	90	65	95	90
Montgomery	10	80	..	...	15		..	82	80	..	..	..	....	....	100	60	105	55
Monroe	11	95	....	..	23	86		85	85	75	65	77	....	....	90	70	85	50
Pike	15	90	12	85	20	70	95	97	57	80	70	85	....	....	...	...	..	....
Putnam	15	95	12	95	30	95	95	100	100	100	...	100	....	....	100	100	100	50
Ralls	4	90	..		10	80	....	50	80	95	...	...	....	....	75	70	110	80
St Charles	11	95	13	100	5	60	....	65	80	55	60	50	....	...	100	60	100	45
Schuyler	15	100	...	....	35	90	..	100	50	90	100	100	....	....	100	75	110	75
Scotland	11	97	11	100	23	86	65	85	45	65	75	90	....	....	75	100	105	50
Shelby	8	93	20	100	19	75		80	75	90	.	100	....	....	90	80	100	70
Sullivan	18	100	11	100	22	98	100	85	60	90	80	95	....	....	95	50	140	85
Warren	13	80	18	76	10	..	80	70	55	85	90	60	....	....	95	75	105	85

NORTHWEST.

Counties.	Wheat.		Rye.		Oats.		Buckwheat—condition ...	Corn—condition	Potat's.		Tobacco—condition......	Sorghum—condition......	Cotton.		Wheat.			Wheat straw to be fed .....
	Y'ld per acre in bu.	Quality of grain ..	Y'ld per acre in bu.	Quality of grain ..	Y'ld per acre in bu	Quality of grain ..			Irish—condition...	Sweet—condition ..			Average condition.	Prospect yield	Soil—condition...	Per cent of sown..	Area com. 1889...	
Andrew	17	100	15	100	85	91	...	68	60	90	..	90	....	....	100	100	150	50
Atchison	12	100	5	100	35	75	..	50	10	..	...	60	....	...	100	35	125	50
Buchanan	17	105	15	95	25	88	...	70	30	85	85	92	...	....	90	80	110	50
Caldwell	18	100	17	98	29	100	100	100	45	85	75	95	...	...	100	80	130	100
Clay	14	100	10	100	25	100	....	85	70	50	..	75	....	....	100	80	180	100
Clinton	17	103	15	100	25	100	....	95	50	90	.	90	....	...	100	75	120	100
Carroll	17	100	18	100	25	90	75	100	20	50	80	100	...	....	110	80	120	20
Daviess	19	100	.	...	25	100	....	100	25	75	....	85	....	....	110	65	125	50
DeKalb	15	105	15	100	24	80	50	75	30	50	...	85	...	..	95	85	145	75
Gentry	18	95	12	90	25	90	100	95	70	75	...	100	....	...	95	95	300	100
Grundy	16	100	20	100	35	80	.	75	40	80	....		..	....	100	75	120	100
Harrison	15	100	12	90	25	90	100	100	70	75	100	100	....	..	100	80	200	50
Holt	20	100	20	95	30	85	..	75	75	80	65	100	....	...	100	75	200	100
Jackson	...	...	....	...	..	..	....	..	...	...	...	...	....	...	...	....	...	..
Lafayette	9	95	6	100	23	100	...	90	25	75	.	90	....	..	110	75	110	85
Livingston	14	85	14	95	30	80	90	85	35	80	90	90	....	...	100	75	140	100
Mercer	18	105	15	100	30	95	...	100	90	100	..	100	..	....	100	75	250	100
Nodaway	22	98	18	98	27	98	...	75	40	60	....	70	....	....	110	95	168	100
Platte	19	110	22	95	21	100	...	90	92	85	20	90	...	..	100	70	130	75
Ray	17	100	.	..	26	98	..	85	60	90	....	85	....	...	100	90	110	70
Worth	18	100	15	100	25	90	95	85	55	75	80	90	...	....	100	90	125	100

SOUTHEAST.

Counties.	Wheat. Yield	Wheat. Quality	Rye. Yield	Rye. Quality	Oats. Yield	Oats. Quality	Buckwheat	Corn	Potat's. Irish	Potat's. Sweet	Tobacco	Sorghum	Cotton. Average condition	Cotton. Prospect, yield	Wheat. Soil—condition	Wheat. Per cent of sown	Wheat. Area comp 1889	Wheat straw fed
Bollinger	8	95	8	100	2	5	40	75	80	100	...	85	...	...	100	60	105	95
Butler	10	100	8	100	20	65	...	90	65	75	90	85	90	75	80	25	100	90
Cape Girardeau	11	100	...	...	5	70	90	80	55	65	100	70	...	...	100	25	110	45
Carter	...	...	...	...	10	85	...	50	50	...	...	85	...	...	85	10	110	55
Crawford	5	95	6	90	...	...	85	6	60	60	70	75	...	...	85	10	110	85
Dent	7	95	11	100	5	70	100	75	25	75	75	60	...	...	85	35	110	85
Dunklin	12	80	...	...	6	40	...	75	25	80	75	90	90	55	...	...	...	...
Franklin	12	90	15	98	...	...	...	...	70	85	95	100	...	...	100	10	110	30
Gasconade	11	95	8	100	...	...	...	...	65	85	...	75	...	...	85	25	110	90
Howell	8	90	6	70	6	40	...	75	50	75	85	90	100	90	95	20	105	85
Iron	7	90	7	100	5	70	...	70	45	60	15	100	...	...	95	50	110	100
Jefferson	2	80	...	...	0	...	...	70	60	75	...	80	...	...	95	70	105	50
Madison	9	90	10	100	6	80	...	70	65	80	60	75	...	...	105	75	150	100
Mississippi	10	90	...	...	10	70	...	75	40	95	...	80	...	...	100	85	110	25
New Madrid	7	90	...	...	0	...	...	70	50	100	...	100	95	66	100	25	105	10
Oregon	15	...	7	75	8	75	...	50	50	60	100	75	85	15	90	...	...	...
Pemiscot	...	10	...	...	...	...	...	85	50	75	90	95	90	100	...	...	...	...
Perry	11	60	...	...	0	...	...	55	40	75	80	95	...	...	100	40	105	75
Reynolds	6	60	10	75	5	40	...	50	35	25	50	50	...	...	80	15	80	100
Ripley	6	80	...	...	8	45	...	90	60	80	60	75	90	60	100	10	100	100
Scott	12	95	...	...	...	...	...	75	85	65	...	65	85	50	90	10	110	10
Shannon	10	95	5	50	15	60	...	...	80	100	...	80	...	...	85	50	100	100
St Francois	9	95	11	85	2	75	90	85	75	95	85	85	...	...	100	40	100	75
St. Genevieve	9	100	...	...	3	25	...	95	90	75	...	100	...	...	105	25	105	20
St. Louis	11	100	17	95	5	5	80	65	40	50	...	85	...	...	100	10	105	35
Stoddard	14	85	...	...	15	50	...	90	50	80	90	90	100	62	100	75	125	75
Texas	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Washington	9	95	...	...	2	75	...	90	90	100	100	100	...	...	100	50	125	100
Wayne	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

SOUTHWEST.

Counties.	Wheat. Yield	Wheat. Quality	Rye. Yield	Rye. Quality	Oats. Yield	Oats. Quality	Buckwheat	Corn	Potat's. Irish	Potat's. Sweet	Tobacco	Sorghum	Cotton. Average condition	Cotton. Prospect, yield	Wheat. Soil—condition	Wheat. Per cent of sown	Wheat. Area comp 1889	Wheat straw fed
Barry	12	90	...	...	15	75	...	85	65	90	90	90	90	...	80	5	...	50
Barton																		
Bates	13	98	...	...	25	95	...	90	40	95	...	90	...	...	100	80	105	80
Cass	13	100	...	...	29	95	90	90	85	90	...	80	...	...	100	95	160	100
Cedar	11	90	...	...	25	80	...	70	50	70	80	85	...	...	80	20	125	100
Christian	10	92	...	...	15	60	...	80	83	91	100	97	...	...	50	10	105	50
Dade	11	90	15	100	12	70	...	90	45	65	90	100	...	...	50	25	100	100
Douglas	6	80	5	90	15	65	...	90	75	85	85	100	...	...	80	5	110	75
Greene	12	90	10	100	15	70	...	65	15	100	50	95	...	...	80	5	120	85
Henry	12	100	...	...	25	60	...	90	15	90	...	89	...	...	90	60	100	115
Jasper	13	100	...	...	22	90	...	80	45	60	90	90	...	...	80	.	110	..
Johnson	15	10	...	...	24	80	...	100	60	80	...	100	...	...	105	95	110	55
Lawrence	12	97	...	...	17	60	...	90	50	95	100	100	...	...	60	8	120	75
McDonald	10	85	13	90	7	50	...	60	80	75	85	97	50	75	80	10	80	100
Newton	10	95	...	...	15	70	...	75	45	85	75	100	...	...	60	5	115	100
Ozark	7	90	...	...	10	25	...	70	50	75	80	100	60	25	80	10	100	100
Polk	9	100	10	80	15	73	..	70	45	80	75	92	...	...	75	5	120	100
St. Clair	11	90	8	100	15	85	100	80	65	71	...	100	...	...	90	75	150	85
Stone																		
Taney	9	100	...	...	10	75	...	80	90	95	75	85	98	62	50	25	110	100
Vernon	11	95	10	90	27	95	100	90	80	80	90	100	...	...	90	90	135	100
Webster	12	100	15	95	10	62	70	90	55	85	97	100	...	...	70	20	155	100
Wright	11	95	...	...	9	45	...	50	70	90	90	80	...	...	70	10	100	...

CENTRAL.

Counties.	Wheat		Rye.		Oats.		Buckwheat..........	Corn..............	Potat's		Tobacco........	Sorghum........	Cotton.		Wheat.			Straw fed...........
	Yield..........	Quality..........	Yield..........	Quality..........	Yield..........	Quality..........			Irish..........	Sweet..........			Average—condition...	Prospective yield...	Soil—condition......	Per cent sown......	Area comp. 1889......	
Benton	13	100	....	...	16	70	....	95	80	98	...	100	....	...	100	50	90	100
Boone	10	80	15	100	10	60	75	65	45	95	90	98	....	....	100	60	110	85
Callaway	12	90	10	92	12	82	....	76	46	64	100	65	...	....	100	75	110	100
Camden	8	90	....	..	10	80	....	92	60	80	90	100	....	....	80	25	110	100
Chariton	13	105	15	100	20	90	....	100	25	70	80	90	....	....	100	75	125	100
Cole	7	88	13	95	7	68	....	75	65	25	90	100	....	....	105	80	110	60
Cooper	12	100	9	95	17	82	....	90	63	75	90	80	....	....	85	75	100	80
Crawford																		
Dallas	8	100	...		8	75	...	85	40	100	75	100	...	...	50	20	110	100
Hickory	13	95	11	100	20	90	80	100	40	100	60	100	80	....	90	33	110	80
Howard	12	90	15	95	9	70	....	80	40	80	55	80	....	....	100	75	105	75
Laclede	7	100	10	100	4	25	....	60	10	100	60	90	....	....	100	5	100	100
Maries	7	95	8	100	3	17	....	58	33	75	70	80	....	....	90	40	103	100
Miller	11	95	10	100	10	70	100	90	45	90	....	90	....	...	100	25	110	100
Moniteau	11	100	10	100	10	25	..	65	25	50	...	50	....	....	100	85	115	100
Morgan	12	100	..	85	14	50	90	80	50	75	60	95	....	....	100	50	105	75
Osage	14	100	10	...	3	..	....	90	75	100	....	100	....	....	105	10	110	100
Pettis	10	95	10	80	20	50	75	90	25	....	...	100	....	...	100	50	120	100
Phelps	7	95	8	95	3	70	100	65	40	70	80	80	....	....	100	50	100	100
Pulaski	8	100	15	85	10	60	....	90	70	100	100	85	....	....	90	50	115	100
Randolph	12	100	12	60	17	70	75	75	100	55	40	90	....	...	100	65	110	100

OCTOBER, 1890.

COLUMBIA, MO., Nov. 15, 1890.

This being the last monthly crop report of the season, we will briefly summarize the meteorological conditions that have prevailed and the effect produced on the growing crops.

JANUARY.—The month was unusually warm and moist. The mean daily temperature ranged from three degrees above the normal in the northern part of the State to twelve degrees above in the southern portion. The precipitation ranged from one-half inch above the normal in the northwest section to six inches above in the southeast section.

FEBRUARY.—The month was dry and warm. The mean daily temperature was about four degrees above the normal over the entire State. The precipitation was below the normal, the deficiency ranging from one-half inches in the northern portion to one-half inch in the southern portion.

MARCH.—The coldest weather of the winter occurred during the first week of this month. The mean daily temperature was about four degrees below the normal. The precipitation was normal, except in the southeast sections, where it was three and one-half inches above the normal.

By the foregoing it will be seen that but little snow fell during the winter and the weather was unusually warm until March. The wheat, having been thus exposed during the winter and subjected to severe freezing and thawing in March, was seriously injured, much of it never recovering. Fruits also were injured.

APRIL.—The month was warm and dry excepting in the southeast section. The temperature was three degrees above the normal. The rainfall was about one inch below excepting in the southeast, where it was two and one-half inches above the normal. The weather being, on the whole, favorable, wheat improved in condition. The excess of rainfall in the Southeast, was retarding the sowing of oats and planting of cotton. Frosts occurred which did further damage to fruit.

MAY.—The temperature was two degrees below, and the precipitation was below the normal excepting in the Southwest, where it was slightly above. Frosts occurred causing injury to corn, fruit and vegetables. In the northern part of the State the lack of rainfall was beginning to be felt by the growing crops, particularly the wheat. The continued rains in Southeast Missouri caused a decrease in the acreage of oats, which, with the ravages of the grain aphis that made its appearance during the latter part of this month in the southeast corner, and spread north and west over nearly two-thirds of the State, resulted in one of the poorest oat crops ever raised in Missouri. Corn at this time was not promising. Rains in the southeast were delaying planting of this and cotton, and dry weather in the northern part of the State was causing the seed corn to germinate and start poorly. More favorable conditions were prevailing in the southwest, and in that section an unusually large acreage of flax was being sown.

JUNE.—The month was unusually warm and dry. The mean daily temperature was three and one-half degrees above and the rainfall about two inches below the normal.

The effect of the warm, dry weather during the latter part of the month was to hasten the ripening of the wheat, and much of the crop was in the shock before the end of the month. It was found to be thin on the ground and badly mixed with chess. The heads were, however, well filled with grain of an excellent quality, and being secured without damage by rain, the crop has proven, on the whole, to be a fairly remunerative one.

Corn, while small for the season, was of good color, but was needing rain.

The fruits were now showing the effects of the late spring freezes.

JULY.—Temperature was one and one-half degrees above and the rainfall one and one-half inches below the normal. The weather was favorable for harvesting the hay and oat crops, but the lack of rain was being seriously felt by pastures, corn and other growing crops. The dry weather resulted in a reduced acreage of buckwheat and tobacco.

AUGUST.—Temperature was two and one-half degrees below the normal for the State, and the rainfall was one and one-half inches below in the northeast to four inches above the normal in Southwest Missouri. The continued lack of rain in Northeast Missouri was having a discouraging effect on crops, particularly corn, which showed a condition in that section of only 69 per cent. There had been an improvement, however, in the crop in the leading corn-growing sections, and the condition for the State was 74 per cent.

Potatoes were by this time showing the full effect of the drouth, the early crop being very light. Late spring freezes, drouth and codlin moths had resulted in a light crop of apples.

SEPTEMBER continued dry in the northeast and wet in the southwest. Frost on the 13th cut the corn fodder and hastened ripening, and injured the buckwheat and tobacco. The weather was, on the whole, quite favorable for fall seeding, excepting in the southwest, where it was too wet. Corn was being damaged in that section by the excess of rain. A largely increased acreage of wheat was being sown.

OCTOBER was a month of favorable weather for farm work.

The crop season thus brought to a close has been on the whole one of unfavorable conditions, and yields per acre have been less than an average in almost every instance, while some crops have been about as poor as have ever been harvested in the State. But notwithstanding the shortness of crops, there is not one among the leading staples but is worth more dollars in total than the same crop was worth last year, as will be seen by reference to the table given herewith. The seven crops named have been worth over $17,000,009 more on the market to the farmers of the State than these same crops were worth last year, and the labor and expense of securing them much less.

ANIMAL DISEASES.—The communication from Dr. Paquin, State Veterinarian, which follows, shows that live stock has been more than usually free from contagious diseases. The third article of the series on common diseases, prepared by the Doctor for these reports, is submitted herewith.

COLUMBIA, MO., November 6, 1890.

LEVI CHUBBUCK, Esq., *Secretary State Board of Agriculture:*

DEAR SIR: Replying to your request to furnish you data concerning the prevalence of animal diseases in the State as come to my notice officially, I beg you to receive the following:

The reports of the deputies for the last quarter are not yet all in, some of them having been too busy to report at the regular time. From my own observations and the work of this office individually, I note that the most prevalent disease that we had in the last quarter (and which still exists to some extent, though it is declining) was Apthous fever in cattle—a peculiar epidemic form of "mouth disease," with occasional lameness and soreness of the feet. We have tested the material drooling from sore mouths and have failed to inoculate it. From these experiments and a large number of observations of various professional men and stockmen, we have become convinced that the malady is not contagious.

The treatment prescribed in our circular letter on the subject was successful. It consisted in washing or swabbing the mouth with a saturated solution of alum or borax, or both drugs combined. The hygienic treatment consisted in feeding the diseased stock by pushing food, easy of mastication, between the molar teeth (grinders) frequently, in order to afford nourishment—starvation being about the only fatal result of the malady.

Black-leg exists in several counties, but it seems (from the report) to a less extent than last year at this date. My information on the distribution of this disease is limited at this date. But all who write about it ask for a remedy. We prescribe preventive inoculation, which has proven so efficacious, even among cattle in which outbreaks had already caused several deaths. Yet very few want to spend a trifle to save their calves. Some write as though they expected the State to prepare a remedy, pay for it and send it free of cost. The State has done her share in this matter by verifying the experiments of the French and proving black-leg vaccination practicable and effective, and there are no funds at my command to manufacture medicines or virus of any kind at State expense for the benefit of comparatively few. Besides, there is no law authorizing such a course.

Glanders has prevailed in various counties, but I am unable just now to give you full details.

Texas fever did not prevail near as extensively as last year in the corresponding months. The State and National quarantine regulations, and the attention paid to them almost uniformly by the railroads and stock-yards, had a very good effect in curtailing the damages that have occurred every year heretofore by Texas fever in the State of Missouri.

I am compiling my regular report on the veterinary service, and after it is presented to the proper authority, as specified by law, I will gladly give you a detailed statement.

Very truly yours,
P. PAQUIN,
State Veterinarian.

ANNUAL MEETING.—At the annual meeting of the Board of Agriculture, held on the 6th inst., in Columbia, the following officers were elected for the ensuing year: F. W. Smith, Columbia, President; Abiel Leonard, Mt. Leonard, Vice-President; Levi Chubbuck, Columbia, Secretary, and J. S. Clarkson, Columbia, Treasurer.

THE ANNUAL REPORT.—In accordance with the law, thirty copies of the 22d Annual Report of the Board of Agriculture have been sent to each county clerk in the State, and twenty copies to each member of the General Assembly, for distribution to the farmers in their respective counties. A limited number of copies have just been received from the State printers, and until the supply is exhausted, copies will be sent to those requesting them.

These reports are intended to be volumes of information for the farmers of the State, and as much is compressed into the 500 pages as is possible to get into them. Contributions from those who have had experience in any line of farming or farm life which will be helpful to others to know of will be gladly received and published. Those who have records of rainfall, and other meteorological data, will confer a favor by sending copies to this office. We would also like to get plans of barns, and other farm buildings that may be considered worthy of imitation, for use in the next annual report of the Board.

FARMERS' INSTITUTES.—In addition to the series of farmers' institutes held in Northwest Missouri, during October, a series will be held in the northeast section during the week beginning December 15. Another series will be held in the southern part of the State, beginning December 29. These meetings are held by the Board of Agriculture for the purpose of getting the farmers of the different counties together to discuss methods of crop culture, stock-breeding, dairying, fruit-growing, poultry-raising, and other topics of interest to them as farmers. The attendance of men who have made special study in the different lines of agriculture is secured to discuss means and methods by which success may be obtained. This line of work would be productive of much good to the farmers of the State if the Board was in possession of sufficient funds with which to carry it forward properly.

SCHOLARSHIPS IN THE MISSOURI BOTANICAL GARDENS.—By the will of the late Henry Shaw, the founder of the Missouri Botanical garden at St. Louis, provision was made for a number of scholarships in the garden, to be awarded to deserving young men. The value of these scholarships to young men of limited means who desire to become thorough, practical horticulturists, is such that we wish to call attention to them.

They are for six years. During the first year the pupils are required to work in the garden nine or ten hours daily, under the direction of experts. In the second year they will work five hours daily in the Garden, and in addition thereto will be given instruction in vegetable and flower-gardening, small-fruit culture and orchard culture. In the third year, in addition to the five hours of daily labor they will be instructed in forestry, botany, landscape gardening, surveying and draining. In the fourth year, besides the customary work, they will continue the study of botany, garden vegetables and fruits, and will be given a course in simple book-keeping, legal forms of leases, deeds, etc. In the fifth year, besides the customary work, there will be study of vegetables, physiology, economic botany and fungi, and each pupil will be expected to keep a set of accounts. In the sixth year, in addition to the manual work, the pupils will continue the study of the botany of garden and green-house plants, of ferns, and of trees in their winter condition, besides the theoretical part of special gardening.

That the lack of means need not deter any young man from obtaining such training as is contemplated, each regularly appointed pupil holding a scholarship will be entitled to the following wages: For the first year, $200; for the second year, $250; and, for each year after the second year, $300; together with plain but comfortable lodgings near the garden. The young men must be between fourteen and twenty years of age, and possess a good elementary English education. Those desiring to apply for a scholarship should write to William Trelease, Botanical garden, St. Louis, Missouri.

In concluding this, the last report of the season, we wish to express the thanks of the Board to the correspondents and to the Press of the State for the invaluable assistance rendered in gathering and disseminating information. We look forward to the time when the farmers of the State will more fully appreciate the value of the service rendered, and will insist that fuller compensation be made than is now possible.

TABLE OF SUMMARIES.

	Acres.	Yield per acre.	Total yield.	Price per bu., lb. or ton.	Total valuation.	Total valuation, 1889.
Corn..........	6,470,000	25.	161,750,000	$ .385	$62,273,750	$50 330,000
Wheat........	1,600,000	11.6	18,560,000	.84	15,790,400	14 720,000
Oats..........	1,380,000	17.	23,346,000	.34	7 976,400	6,950 000
Hay.........	1,590,000	1.37	2,146,500	6.78	14,553,270	11,700,000
Flax..	45,000	9.	405,000	1.15	465,750	396,000
Tobacco.....	12,000	744.	8,928,000	.083	696,024	557,000
Potatoes.....	85,000	36.5	3,102,500	.91	2,823,275	2,138,000
Total.......	11,182,000		218,238,000		$104,578,869	$86,791,000

VALUE OF LIVE STOCK PER HEAD.

	State.	N. E.	N. W.	S. E.	S. W.	Cent'l
Mules	$87 72	$96 00	$90 00	$81 80	$85 00	$85 80
Horses	71 42	78 55	79 00	68 10	70 00	71 00
Stock cattle	16 33	16 50	23 00	10 44	17 00	14 70
Stock hogs.....	4 05	4 00	5 12	3 62	4 00	3 50
Cows..............................	17 39	17 00	22 00	14 05	18 00	15 88
Spring calves	6 10	7 00	8 00	3 96	4 74	6 82
Sheep	2 87	3 70	2 93	2 33	2 31	3 08
Lambs	2 17	2 70	2 21	1 64	1 83	2 45

YIELD, QUALITY AND PRICE OF GRAIN CROPS.

	Northeast.			Northwest.			Southeast.			Southwest.			Central.		
	Yield per acre..	Quality........	Price..........	Yield per acre.	Quality........	Price..........	Yield per acre.	Quality........	Price..........	Yield per acre.	Quality........	Price..........	Yield per acre.	Quality........	Price..........
Corn..................	23	85	$ .41	25	88	$,86	25	85	$ 445	24	79	$ .35	25	79	$ .38
Wheat.........................	12	94	.87	17	100	.84	9	90	.8575	11	94	.82	10	96	.81
Oats	20	77	83	28	92	.31	6	58	.4466	18	74	.44	16	92	.33
Hay...........................	1.18	97	7.80	1 26	99	5.27	140	95	9.48	1 36	94	5 70	1 40	96	6.13
Flax...............	7	100	1.00	9	100	1.15	...	...	.....	9	100	1.17	10	100	1 06
Rye.......	12	95	.57	16	98	.48	14	88	.66	10	77	.64	9	92	.59
Buckwheat.................	15	88	.. ..	15	91	...	...	...	...	10	94	.....	9	84	.....
Tobacco.......................	760	73	.0825	750	80	.03	725	98	.108	677	88	.048	755	87	.06
Cotton	..	..		..	....	.. .	507	99	....	565	95	.....	..		.....
Sorghum.......................	72	100	.40	92	100	.42	86	100	.35	108	100	.32	86	100	.35
Irish potatoes..............	30	72	95	39	69	.93	41	69	.99	38	72	.82	32	67	.88
Sweet potatoes..............	61	95	.91	77	93	.91	68	91	.70	103	94	.60	62	89	.77
Apples	80		.53	88	...	.69	50	....	.54	92	...	.50	100	...	.45

THE CROPS OF 1890.

From the December Report of the Department of Agriculture, Washington.

CEREAL CROPS OF THE YEAR IN DETAIL.

The season was distinctly unfavorable to full production in any of the staple cereals. Seeding and planting took place under discouraging circumstances; the period of early growth was attended by adverse meteorological conditions, the later season marked by alternations of flood and drouth, and even the harvest interfered with by the lack of seasonable weather. All of these unfavorable conditions were of course not constantly present everywhere, but they were present throughout the whole crop year in one district or another of large production, and there is hardly a prominent grain State in which the yield per acre of corn, oats or winter wheat is as large as the average of the past ten years.

It must not be presumed, however, that this partial crop failure will result in a stinted domestic food supply, or even prevent America from still being the granary from which the Old World may draw supplies with which to eke out her own deficiencies. With a crop of corn 30 per cent smaller than that of the previous year, making the smallest yield per acre with two exceptions noted in twenty years, we have a production per head of our population of 23 bushels, or 50 per cent more than the average production per capita of all cereals in Europe. Of wheat we have grown this year more than twice the average per head of Europe, and our prior reserves, though somewhat depleted, with the small surplus which will remain over home requirements from this crop, will enable us to meet all probable foreign demands should ruling prices warrant a close clearing up of both visible and invisible stocks.

CORN.

The area of corn, which was slightly increased in planting, was reduced by failure and utter abandonment by more than 6,000,000 acres, the breadth harvested being estimated at 71,970,763 acres. In this breadth there are properly included all areas not absolutely abandoned, all fields even though producing but a few bushels per acre; and this fact, as well as that the estimated production is not in merchantable corn, but all corn—good, bad, soft, or nubbins—should be born in mind in all comparisons with previous years, and in calculations of commercial supplies. The question of proportion of the crop merchantable is always investigated later, after husking and partial feeding of the crop give ample opportunity for mature judgment. The greater portion of the 6,000,000 acres planted but abandoned was of course in Kansas and Nebraska, the result of the severe drouth which afflicted large areas in each State, but there was an unusually large area so lost in many other districts.

The estimated product is 1,489,970,000, bushels or yield of 20.7 bushels per acre. With the single exception of 1887, another year of severe drouth, this is the smallest aggregate grown in any year since 1881. It is only 70 per cent of last year's great crop, but the disparity in commercial corn between the two seasons is even greater. The seven States of Ohio, Indiana, Illinois, Iowa, Missouri, Kansas and Nebraska are the corn-surplus States, practically furnishing all that enters commercial channels. The crop in the other States is consumed where grown, and it exerts an influence on commercial corn only as it supplies home requirements or makes necessary a demand on the surplus States. Outside of these seven States the yield is practically only of local interest.

The diminution in rate of yield this year is largely in this important belt of States, they producing but 860,000,000 bushels against 1,413,000,000 bushels in 1889—a falling off of nearly 40 per cent. This analysis shows an even smaller supply of commercial corn than the estimates of aggregate production would indicate. There is another important point, which is generally overlooked in the hasty generalization of commercial writers, bearing most strongly upon the question of supply. Our annual records show that five-sixths of the crop is consumed in the county where grown, only about 20 per cent being distributed beyond county lines. This consumption on the farm is in the nature of a fixed requirement for work animals, meat production, seed, etc., and is a demand not flexible in its character. The stimulus of high prices would of course shorten to some extent the rations of beasts, but very high prices indeed must rule before the commercial supply would be largely augmented at the expense of home consumption. Of course, with cheap corn there is a larger and wasteful consumption on the farm, but the records upon which the estimate of 80 per cent is based cover a series of both good and bad years, large and small crops. The demand for farm consumption being thus a comparatively fixed amount, it follows that the percentage of the crop available for distribution beyond county lines must be smaller in bad than in good years. Instead, therefore, of reckoning upon 20 per cent of the present crop being thus available, a smaller percentage must be counted upon. The aggregate crop of 1887 was but little below that of 1890, and the March following it appeared that but 11.7 per cent was available for commercial wants. Instead of the usual one-fifth, less than one-eighth crossed county lines. Should the rates for the present crop run in about the same proportion, the commercial supply from this crop would be less than one-half as great as that from the corn of 1889. In other words, a reduction of 30 per cent in the aggregate crop would involve a reduction of more than 50 per cent in the commercial surplus.

This will account for the fact that elevators throughout the corn districts, which were full last year of cheap corn, are this year empty, and disposes of the argument that because the higher prices offered by dealers do not bring out the supplies there can be no corn in the country.

The rate of yield of the crop is the smallest with two exceptions during twenty years past. In 1887 and 1881, both years of very severe drouth, it was lower. The records of condition throughout the growing season were so uniform that their interpretation was plain, and the November estimates of yield per acre made by our correspondents were very near the final record. The average then given was 19.9, and the final result, after other parallel lines of investigation, is less than one bushel higher. The duplicate investigations included returns of actual acreage and product from more than 90,000 individual farmers scattered through every producing county of the Union, as well as other tests, and the results are extremely gratifying, indicating the substantial accuracy of the returns of our regular correspondents.

The returns of farm value of the crop show in a striking way the influence of short crops upon prices. While the crop aggregates only 70 per cent of that of last year, the aggregate money value of the crop to the producer is $156,000,000 greater.

The advance in value is in greater ratio than the decline in volume. It proves that the law of supply and demand still controls, and that small crops are a sure cure for low prices, but unfortunately the absolute failure of the crop in large districts prevents all growers from sharing in the average enhancement of the remaining product.

The great bulk of our corn crop is used at home, in fact is consumed upon the farms where grown, and but a very small proportion is ever shipped abroad. The shipments, however, small as they are, are extremely variable, depending entirely upon the domestic price. When the volume was greatest, it amounted to but 6.5 per cent of the crop, and from that it ranges down to 1 per cent. The production and exportation, with the annual average of each for twenty years, is presented in the following statement, showing that during that period the foreign demand has amounted to only 3.9 per cent of our production.

PRODUCTION AND EXPORT OF CORN.

Years	Production.	Exports.	Exportation.	Years.	Production	Exports.	Exportation.
	Bushels.	Bushels.	Per cent.		Bushels.	Bushels	Per cent.
1870	1,094,255,000	10.678,553	1.0	1881	1,194,916,000	44,340,683	3.7
1871	991,898,000	35,727,010	3.6	1882	1,617,025,100	41,655,653	2.6
1872	1,092,719,000	40,154,374	3.7	1883	1,551,066,895	46,258,606	3.0
1873	932,274,000	35,985,834	3.9	1884	1,795,528,000	52,876,456	2.9
1874	850,148,500	30,025,036	3.5	1885	1,936,176,000	64,829,617	3.3
1875	1,321,069,000	50,910,532	3.9	1886	1,665,441,000	41,368,584	2.5
1876	1,283,827,500	72,652,611	5.7	1887	1,456,161,000	25,360,869	1.7
1877	1,342,558,000	87,192,110	6.5	1888	1,987,790,000	70,841,673	3.6
1878	1,388,218,750	87,884,892	6.3	1889	2,112,892,000	103,418,709	4.9
1879	1,754,591,676	99,572,329	5.7	Annual average	1,454,299,498	56,768,864	3.9
1880	1,717,434,543	93,648,147	5.5				

WHEAT.

The estimate of the wheat crop of 1890 was closely foreshadowed by the various returns of condition throughout the season. The October estimate of yield per acre is confirmed by later investigations, by returns of threshing, and by the record of individual cultivators received and tabulated during December. The aggregate area harvested is estimated at 36,087,154 acres, against 38,123,859 acres in 1889 and 35,430,333 acres in 1879. This shows but little increase in the breadth harvested during the last ten years, though during that period the acreage ran up to nearly 40,000,000 in 1884 and fell away to 34,000,000 in 1885.

The total product is estimated at 399,262,000 measured bushels.

The season was especially unfavorable in the winter-wheat States, those east of the Rocky mountains suffering from damage wrought by March freezing when fields were bare of snow protection, and the Pacific coast from floods and overflows in the early spring. In no State in which the winter grain makes the bulk of the product is the rate of yield as high as the State average of the last ten years. The year was more favorable in the spring-wheat districts, the yield in the principal states, except the Dakotas, being quite as large as the average. The division into spring and winter wheat is thus made:

	Acres.	Bushels.	Per acre.
Spring	12,567,050	143,888,000	11.4
Winter	23,520,104	255,374,000	10.9

The value of our wheat crop, unlike that of corn, which is regulated by the domestic demand alone, is dependent upon other factors than the volume of our own crop. Its price is affected by the supply of the world, drawn from all sources of production, and as a consequence we have had some large crops with high prices and small crops with lower values. The crop of the United States, however, is a prominent element in determining the world's surplus, and to that extent determines values. The farm value of the present crop has advanced to nearly 84 cents per bushel, and the aggregate value is $334,773,678, only $8,000,000 short of the value of the crop of 1889, although the crop is smaller by more than 90,000,000 bushels.

OATS.

There is a decrease from the acreage of 1889 of slightly more than a million acres in the area of oats harvested, but the great falling off in the volume of the crop is the result of the deficient yield per acre. The year was especially unfavorable for this crop from the beginning, and the final yield is the logical sequence of the returns of condition throughout the growing season. The steady enlargement in the volume of this crop has been one of the features of our agriculture during the past decade, and, like corn, the demand has been for domestic consumption. Its use for human food is steadily increasing, though the aggregate thus used is small. Like corn, it is used as feed for animals, and there is an intimate relation between the two grains growing out of their interchangeable use. The value of the crop depends partially upon the size of the corn crop, and the present crop, short itself, and coming with a small corn yield, commands a high price. The farm price is the highest in ten years, except in 1881, another year of short corn yield.

The yield per acre averages but 19.8 bushels, the lowest ever returned by this office, while the average for a series of years would not be far from 27 bushels.

As in the case of corn, the short crop of the present year is worth more in the aggregate to producers than the crop of 1889, which was the largest ever grown. With a decline in volume of more than 225,000,000 bushels, there is an absolute increase in value of $50,000,000.

THE WORLD'S WHEAT CROP OF 1890.

From the Cincinnati Price-Current of October 23, 1890.]

WHEAT PRODUCTION IN 1890.

A large part of available information in regard to grain production in the different countries of the world is based so much on approximations lacking in definite returns, that it is difficult to reach satisfactory conclusions, but it is likely that in the aggregate the comparisons are not at wide variance from the relative positions for different seasons. There has been considerable shifting of calculations in regard to this year's production of wheat in various countries. The preponderance of evidence appears to justify the following estimates as approximating the situation, in comparison with 1889, as compiled by the Cincinnati Price-Current:

Countries.	1890. Bushels.	1889. Bushels.
France	320,000,000	307,000,000
Russia	225,000,000	188,000,000
Italy	120,000,000	104,000,000
Spain	70,000,000	75,000,000
Hungary	155,000,000	94,000,000
Austria	44,000,000	40,000,000
Germany	105,000,000	82,000,000
United Kingdom	75,000,000	78,000,000
Turkey in Europe	40,000,000	40,000,000
Roumania	55,000,000	45,000,000
Belgium	25,000,000	19,000,000
Portugal	8,000,000	8,000,000
Holland	6,000,000	6,000,000
Greece	5,000,000	5,000,000
Denmark	5,000,000	5,000 000
Servia	6,000,000	5,000,000
Sweden and Norway	4,000,000	4,000,000
Switzerland	2,000,000	2,000,000
Total Europe	1,270,000,000	1,107,000,000
India	225,000,000	243,000 000
Algeria	25,000,000	21,000,000
Egypt	10,000,000	8,600,000
Australasia	35,000,000	26,000,000
Chili, Argentine, etc	35,000,000	24,000,000
Sundry	330,000,000	322,000,000
United States	400,000,000	490,000,000
Canada	40,000,000	31,000,000
North America	440,000,000	521,000,000
Aggregate bushels	2,040,000,000	1,950,000,000

In this presentation the world's wheat production this season is shown to be 90,000,000 bushels, or 4½ per cent in excess of the deficient quantity last year. These calculations omit various countries, such as Asia Minor, Persia, Syria, South Africa, etc., in which an aggregate of about 100,000,000 bushels is annually produced, but which does not essentially affect the recognized commercial supplies.

While the indicated production of wheat this year exceeds 1889, it is not in excess of an average of a series of years according to the following approximations:

	Bushels.
1890	2,040,000,000
1889	1,950,000,000
1888	2,045,000,000
1887	2,125,000,000
1886	2,090,000,000
1885	2,000,000,000
1884	2,185,000,000
1883	1,935,000,000

COMPARATIVE GRAIN CROPS OF UNITED STATES FOR A SERIES OF YEARS.

Crop of	Wheat, bush.	Corn, bush.	Oats, bush.	Rye, bush.	Barley, bu.
1868	224,036,600	906,527,000	254,960,800	22,504.800	22,896,100
1869	260,146,900	847,320,000	288,334,000	22.527,900	28,652,200
1870	235,884,700	1.094,700,000	247,277,400	15,473.600	26,295.400
1871	230.722,400	991,898.000	255.743,000	15,365,500	26.718,500
1872	249,997.100	1,092,719.000	271,747,000	14,888.600	26,846,400
1873	281,254,700	932,274,000	270,340.000	15,142,000	32,044,490
1874	309,102,700	850,148.500	240,369.000	14.990,900	32,552.501
1875	292.136,000	1,321,069,000	354,317,500	17,722.100	36,908,600
1876	289,356,500	1,283,827,500	320,884,000	20,374,800	38,710,500
1877	364,194,146	1.342,558,000	406,394,000	21,170,100	34,441,400
1878	420.122.400	1,388,218,750	413,578,560	25.842.790	42,245,630
1879	448,756.630	1,547,901,790	363,761,320	23,639,460	40,283.106
1880	498,549.868	1,717,434.543	417,885,380	24,540.829	45.165,340
1881	383.280,090	1,194.916.000	416,481,000	20,704.950	41.161,330
1882	504,185,470	1,617,025,100	488.250,610	29.960,037	48.953 926
1883	421,086.160	1,551,066.895	571,302.400	28,058,583	50.136.097
1884	512,763,900	1,795,528.432	583.628.000	28,637,594	61,206.652
1885	357,112,000	1,936,176,000	629,409.000	21,756,000	58,360.000
1886	457,213,000	1,665,441,000	624,134,000	24,489,000	590428,000
1887	456,329,000	1.456,161,000	659,618.000	20,691,000	56.812.000
1888	414.868,000	1,987,790.000	701.735.000	23,415,000	63,884,000
1889	490.560.000	1,112,892.000	751,515,000		
1890	399,262,000	1,489,970,000	523,621,000		

HARVEST TIME OF THE WORLD.

The following shows the months of the wheat harvest in the different wheat-growing sections of the world:

January—Australia, New Zealand, Chili and Argentine.

February and March—East India and Upper Egypt.

April—Lower Egypt, Syria, Cyprus, Persia, Asia Minor, India, Mexico, and Cuba.

May—Algeria, Central Asia, China, Japan, Morocco, Texas and Florida.

June—Turkey, Greece, Italy, Spain, Portugal, south of France, California, Oregon, Louisiana, Mississippi, Alabama, Georgia, Carolina, Tennessee, Virginia, Kentucky, Kansas, Arkansas, Utah, Colorado and Missouri.

July—Roumania, Bulgaria, Austro-Hungary, south of Russia, Germany, Switzerland, France, south of England, Nebraska, Minnesota, Wisconsin, Iowa, Illinois, Indiana, Michigan, Ohio, New York, New England and Upper Canada.

August—Belgium, Holland, Great Britain, Denmark, Poland, Lower Canada Columbia and Manitoba.

September and October—Scotland, Sweden, Norway and north of Russia.

November—Peru and South Africa.

December—Burmah.

. PRODUCT, AREA AND VALUE OF THE WHEAT CROP OF 1890.

Reported by the Department of Agriculture, Washington.

States and Territories.	Acres.	Bushels.	Value.
Maine	40,213	543,000	$624,307
New Hampshire	9,155	140,000	161,083
Vermont	19,475	335,000	371,874
Connecticut	1,876	30,000	33.018
New York	640,540	9,288,000	9,287,830
New Jersey	138,833	1,680,000	1,679.879
Pennsylvania	1,337,437	16,049,000	15,888,752
Delaware	94,790	919.000	882,684
Maryland	535,143	6.208.000	5,711,046
Virginia	801,956	5.614.000	5,389,144
North Carolina	717,228	3,156,000	3,155,803
South Carolina	178,609	750.000	787,608
Georgia	344,159	1,411,000	1,552,157
Alabama	293,049	1,319,000	1,437.406
Mississippi	60,750	286,000	314.078
Texas	510,711	3.575,000	3,396,228
Arkansas	221,848	1,575,000	1,543,619
Tennessee	1,175,052	7,873,000	7.636,663
West Virginia	302,086	2,328,000	2,209.759
Kentucky	943,518	9,152,000	8,419,955
Ohio	2,398,741	29,984,000	27,285.679
Michigan	1,501,561	20,271.000	18,243,967
Indiana	2,493,605	27,928,000	24,576,971
Illinois	1,853,173	18,161,000	15,800,153
Wisconsin	1,073,475	13,096.000	10,870,008
Minnesota	3,143,917	38,356,000	31,068,187
Iowa	1,685,080	19,041,000	15,233,123
Missouri	1,603,459	17,638,000	14,639,581
Kansas	2,058,0[illegible]0	28,195,000	21,709,842
Nebraska	1,418,059	15,315,000	11,639,428
California	2,426,730	29,121,000	22,131,778
Oregon	878,250	12,865,000	9,648,844
Nevada	18,489	250,000	214,658
Colorado	96,030	1,777,000	1,439.010
Arizona	25,930	311,000	280,044
The Dakotas	4,209,482	40,411,000	28,287.719
Idaho	83.056	1,370.000	1,068.931
Montana	87.550	1,488,000	1,100,680
New Mexico	90.610	1 105,000	1,050.170
Utah	130,251	2,279,000	1,777,927
Washington	436,275	8,071,000	6,134.027
Total	36,087,154	399,262,000	$334,774,678

Spring wheat..........................143,888,000 bushels, or 11.4 bushols per acre.
Winter wheat..........................255,374,000 " 10.9 " "

PRODUCT, AREA AND VALUE OF THE CORN CROP OF 1890.

Reported by the Department of Agriculture, Washington.

States and Territories.	Acres.	Bushels.	Value.
Maine	27,855	1,008,000	$746,180
New Hampshire	34,487	1,259,000	906,319
Vermont	54,893	1,839,000	1,324,020
Massachusetts	54,134	1,868,000	1,307,336
Rhode Island	12,307	402,000	289,756
Connecticut	56,407	2,014,000	1,409,611
New York	642,896	17,101,000	11,115,672
New Jersey	357,342	11,185,000	6,934,579
Pennsylvania	1,383,377	38,043,000	22,825,721
Delaware	223,136	4,128,000	2,064,008
Maryland	725.907	16,333 000	8,166,454
Virginia	2,109,853	36,922,000	20,307,335
North Carolina	2,726,585	36,264,000	19,914,977
South Carolina	1,576,230	16,078,000	11.254,282
Georgia	2,981,486	31,306,000	21,600,866
Florida	491,428	4,570,000	3,427,710
Alabama	2,489,226	25,390,000	17,265,271
Mississippi	1,951,651	24,396,000	17,076,947
Louisiana	1,061,169	16,979,000	11,885,093
Texas	4,116,281	63,802,000	45.937,696
Arkansas	2,002,575	33·443,000	21,737,952
Tennessee	3,600,657	67.692.000	35,200,023
West Virginia	671,733	13,435,000	8.060,796
Kentucky	2,816.155	63,645,000	31,186,100
Ohio	2,827,277	65,876,000	33,596,533
Michigan	977,188	26,580,000	14,618,733
Indiana	3,604,252	89,025,000	41,841,761
Illinois	7,154.424	187,446.000	80,601,741
Wisconsin	1,102,022	33,061.000	14,877,297
Minnesota	768,449	21,286,000	8,940,136
Iowa	8,771,299	232.439,000	95,300,164
Missouri	6,796,318	175.345,000	77,151,802
Kansas	3,542,891	55,269.000	28,187,241
Nebraska	3,072.800	55,310.000	26.548,992
California	159,871	4,396,000	2,857,694
Oregon	8,011	173,000	114,205
Colorado	42,133	767,000	483,097
The Dakota	884,593	12,030,000	6,015,233
New Mexico	56,289	1,126,000	821,819
Utah	35,175	739,000	502,299
Total	71,970,763	1,489,970,000	$754,433,451

PRODUCT, AREA AND VALUE OF THE OAT CROP OF 1890.

Reported by the Department of Agriculture, Washington.

States and Territories.	Acres.	Bushels.	Value.
Maine	100,607	2,847,000	$1,622,891
New Hampshire	31,359	862,000	482,929
Vermont	106,591	2,793,000	1,396,342
Massachusetts	23,275	598,000	328.992
Rhode Island	6,545	153,000	82.703
Conneticut	39,019	780,000	413,601
New York	1,343,418	23,913,000	11.956,420
New Jersey	141,537	2,449,000	1,224.295
Pennsylvania	1,277,424	21,972,000	10,546,413
Delaware	22,931	298,000	134,146
Maryland	113,075	1,357,000	597,036
Virginia	672,178	6,587,000	2,964,305
North Carolina	673,672	6,198,000	3,160.869
South Carolina	393,226	4,168,000	2,500.918
Georgia	562,387	5,455,000	3,273.092
Florida	53,540	573,000	349,456
Alabama	405,344	4,864,000	3,015,759
Mississippi	361,992	4,778,000	2,866.976
Louisiana	42,952	567,000	345,849
Texas	639,274	11,059,000	6,082,692
Arkansas	293,831	3,967,000	2,102 361
Tennessee	682,759	6,486,000	2,918,795
West Virginia	142,107	1,506,000	677,850
Kentucky	465,152	3,954,000	1,779,206
Ohio	1,111,332	20,004,000	8,401.670
Michigan	941,088	25,033,000	11,014.494
Indiana	1,017,122	17,800,000	7,297,850
Illinois	3,372,451	70,821,000	29,036,803
Wisconsin	1,496,888	38,919,000	15,567.635
Minnesota	1,500,084	38,408,000	14,208,796
Iowa	2,767,330	71,397,000	27,130,903
Missouri	1,412,571	24,579,000	9,585,707
Kansas	1,302,884	31,269,000	11,882,302
Nebraska	1,053,059	22,430,000	8,747,761
California	70,655	1,943,000	1.088,087
Oregon	221,940	6,658,000	3,329,100
Colorado	100,725	2,498,000	1,248,990
The Dakotas	1,183,157	24,846,000	7,950,815
Idaho	36,440	1,093,000	634,056
Montana	90,235	2,797,000	1,650,398
New Mexico	16,330	392,000	223,394
Utah	38,491	1,059,000	582,177
Washington	104,392	3,497,000	1,643,652
Total	26,431,369	523,621,000	$222,048,486

TOBACCO STATISTICS.

WASHINGTON, June 4, 1891.

Regular correspondence of the St. Louis Republic.

The Census Bureau to-day issued a bulletin containing the tobacco statistics for the State of Missouri for the last year or so, called the census year. From this publication, it seems that there are 10,495 people engaged in tobacco culture, with a total acreage devoted to the crop of 11,350. The total product for the year amounted to 9,424,823 pounds. The value of the crop to the producers on the basis of actual sales was $419,520. The report was made by Prof. Conrad. The following are the figures by counties, excluding those producing less than 2,000 pounds each:

Counties.	Acres	Pounds.	Value.	Counties.	Acres	Pounds.	Value.
Adair	18	15,523	$1,174	Holt	76	79,640	5,943
Andrew	7	3,855	500	Howard	786	686,956	17,868
Audrain	14	5,975	576	Howell	68	37,197	2,980
Barry	169	10,194	9,300	Iron	17	51,950	1,164
Barton	20	11,300	1,017	Jackson	32	23,291	1,620
Bates	34	25,089	3,063	Jefferson	5	2,680	294
Benton	26	17,998	1,836	Johnson	11	6,969	757
Bollinger	21	11,041	1,000	Knox	32	26,016	1,789
Boone	38	19,695	1,412	Laclede	49	29,528	3,593
Buchanan	12	16,190	810	Lafayette	9	6,456	470
Butler	18	10,160	914	Lawrence	32	18,560	1,739
Caldwell	16	8,549	928	Lewis	17	16,775	795
Callaway	751	398,946	28,166	Lincoln	116	71,415	3,570
Camden	37	18,368	1,862	Linn	275	244,808	10 500
Cape Girardeau	24	13,066	1,218	Livingston	106	91,460	4,289
Carroll	667	602,763	29,410	McDonald	547	31,450	3.343
Carter	8	3,345	330	Macon	624	455,306	10,836
Cass	13	10,200	480	Madison	10	3.151	887
Cedar	90	47,262	3,425	Maries	16	10,918	1,025
Chariton	3,453	3,569,857	95,313	Marion	14	10.471	1,047
Christian	38	25,377	2,460	Mercer	31	19,352	2,303
Clark	5	3,127	306	Miller	20	10.453	958
Clay	30	14,463	1,212	Mississippi	30	16,960	845
Clinton	22	16,857	1,400	Moniteau	20	12,776	1,333
Cole	8	4,112	481	Monroe	130	86.990	4.436
Cooper	15	1,067	879	Montgomery	128	88.086	6,490
Crawford	11	5,495	604	Morgan	15	8,487	990
Dade	47	31,947	26,095	New Madrid	4	3,450	148
Dallas	53	33,607	3,303	Newton	45	30.198	2.743
Daviess	53	42,239	3,000	Nodaway	7	6,017	707
DeKalb	15	11,695	1,170	Oregon	23	9,190	932
Dent	39	24,841	1,865	Osage	27	18,455	972
Douglas	104	55,609	3,636	Ozark	58	34,125	3,481
Franklin	17	12,147	1,117	Perry	8	6,125	919
Gasconade	12	8,081	921	Pettis	10	7,535	775
Gentry	13	11,050	956	Phelps	32	19,140	1,375
Greene	115	73,775	4,854	Pike	122	72,619	2,432
Grundy	28	19,845	2,135	Platte	27	14,535	1,334
Harrison	45	22,181	2,660	Polk	48	31,579	2,978
Henry	22	11,230	1,248	Pulaski	44	23,350	2,232
Hickory	34	24,540	2,296	Putnam	14	78,876	756

TOBACCO STATISTICS—Continued.

Counties.	Acres	Pounds.	Value.	Counties.	Acres	Pounds.	Value.
Ralls............	8	4,435	603	Stoddard	70	34,330	2,506
Randolph........	6,269	240,428	5,865	Stone............	19	13,837	1.234
Ray..............	29	20,374	1,902	Sullivan.........	43	35,685	1.963
Reynolds........	22	7,750	984	Taney...........	36	31,719	3.171
Ripley	46	29,965	3,439	Texas...........	90	56,964	4,384
St. Charles......	21	11,900	250	Vernon..........	43	27,085	2.381
St. Clair........	47	31,659	2,727	Warren	44	29,875	1,872
St. Francois.....	12	5,487	1,152	Washington	25	12,569	1,455
Ste. Genevieve.	8	3,645	765	Wayne..........	10	6,535	763
Saline...........	557	531,372	15.940	Webster	152	101.209	5,430
Schuyler........	218	209,898	11,500	Worth...........	11	6,022	870
Scotland........	132	140,732	77,100	Wright...	80	46,474	4,053
Scott............	7	3,200	100	Other counties..	8	4.425	4,422
Shannon	27	16,023	1,580				
Shelby..........	17	12,710	440	Total..........	11,350	9,424,823	$419,520

TOTAL AREA AND PRODUCTION OF VINEYARDS AND CAPITAL INVESTED IN THE UNITED STATED, BY STATES.

[From United States Census Bulletin.]

States.	Area in bearing vines.	Area in non-bearing vines	Average yield grapes per acre	Market value grapes per ton	Grapes sold for table use	Grapes sold to wineries	Wine made..........	Market value of wine per gallon	Total value of plant, including land......	Total laborers employed (all kinds)..
	Acres.	Acres	Tons	Dollars	Tons.	Tons.	Gallons	Dollars	Dollars.	Number.
Total........	307.575	93,686	......	... .	267.271	304.868	24,306,905	....	155,661.150	a200,780
Arizona.........	1,000	1.500	3 00	16 50	2,850	150	25 000	1 00	75,000	1,250
California.......	155,272	45,272	1 77	17 66	38,785	b255,526	14 626,000	19	86.640.350	100,422
Georgia	1,938	2,154	1.33	96 00	1,938	646	107,666	1 15	1,227,600	2,046
Illinois	3,750	990	2.00	54 00	6,000	1,500	250,000	1 00	1,422,000	2,370
Indiana	3,850	1,000	1 75	67 00	5,390	1,347	224,500	1 00	1,455,000	2.425
Kansas	4,542	1,000	2 00	58 00	8,294	790	130 990	80	1,662,600	2.771
Missouri	10,000	1,764	3.00	50 00	22,500	7,500	1,250,000	56	4,605,600	5,882
New Mexico ..	1,186	9,000	3.00	45 00	1,779	1,779	296,500	86	3,055 800	5,093
New York *(c)*...	43,350	7,650	1.75	70 00	60,687	15,172	2,528,250	50	20.400,000	25,500
North Carolina.	4,000	1,200	1.75	60 00	4,667	2,333	388,833	1 00	1,560,000	2.600
Ohio	28,087	4,956	1 80	57 00	38,947	11,609	1,934 833	56	13,217,200	16,521
Tennessee.......	1,500	600	2 50	89 00	2,500	1,250	208,333	1 00	630,000	1,050
Virginia.	4,100	1,600	2 00	60 00	5,484	2,766	461,000	1.00	1,710,000	2,850
Other states and terriories......	45,000	15,000	2.00	60 00	67,500	22,500	1,875 000	1 00	18,000,000	30,000

(a) It should be noted that while the average number of laborers employed in viticulture is shown to be one person to two acres, the average for those directly employed in growing the grapes is but one person to three acres, the others being engaged in the curing of raisins, manufacture of wine, transportation of products, etc.

(b) This includes for California 41,166 tons made into raisins and 23,252 tons used for dried grapes and purposes other than table fruit.

(c) Includes 1,000 acres in Erie county, Pennsylvania, known as part of the Chautauqua district of New York.

WESTERN DIVISION.

This division, consisting of Missouri and Kansas, has made but little progress during the past ten years. The vineyards in Missouri, except in a few localities, have been devastated or ruined. Mr. Herman Jaegars, government experimental agent for the state of Missouri, says:

> In Newton county there are but 20 acres left, but this does not apply to grapes grown in gardens on most farms. From 1866 to 1875 there were several hundred acres of vineyards in Newton and adjoining counties. Most of these were grubbed up and abandoned, owing to the prevalence of black-rot. Now that we are certain that we can prevent black-rot and mildew with spraying, replanting has commenced, and will probably become general in a year or two more. As far as I know, the situation is similar to this all over Southwestern Missouri.

For the purposes of this investigation, Hermann, in Gasconade county, Missouri, was visited, but no devastation was seen in the vineyards. One of the largest and best vineyards in the State is located here, and contains 80 acres, apparently nearly all wine grapes.

Mr. Miessner, of Bushburg, Jefferson county, Missouri, a well-known and reliable authority, reports to this office that the ravages of the black-rot did not become ruinous until 1875, when the disease developed over a large portion of the southern half of the State, and resulted in the greatest damage to the grape crop of that section. Since that year black-rot has been of annual recurrence, marked by more or less disastrous consequences to the grape crop. In some years the loss would be no less than half the crop, or even more, while in other seasons it would be but a small percentage, confined chiefly to varieties most subject to the disease.

Mr. Miessner further says:

> The growth of viticulture in many sections of our State has received a check. A large number of the vineyards have been abandoned. The planting of new vineyards has been reduced in some localities. Spraying the vines, as recommended by the Department of Agriculture, with the Bordeaux mixture and Eau Celeste, has been experimented with by many growers, and when applied early, thoroughly, and often enough, has given encouraging results. There is now a well-founded hope that by the intelligent and persistent use of the copper salt remedies we shall conquer the black-rot, as well as the mildew, perenospora, and other fungoid diseases.

In Kansas, in this division, there have been small plantings of vines in various parts of the State, aggregating some 5,542 acres of young and old vines, raising some table grapes and making some wine for its home market. The prospects for grape-growing in the western division are improving.

LIVE STOCK IN MISSOURI.

In the following table is given the number of the different classes of live stock in every county in Missouri, excepting Scotland and Ozark, for the years 1889 and 1890. These figures are authoritative and the latest to be had, being furnished this office by the county clerks of the respective counties. It is hoped that the table will be of value to the stock-raisers of the State, in affording them a means of determining the relative supply of the different classes of stock.

Thanks are due the county clerks of the State for their kindness in supplying the figures for their respective counties.

NORTHEAST MISSOURI.

Counties.	Horses.				Mules.				Jack stock.				Neat cattle.				Hogs.				Sheep.			
	1889.	1890.	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.	1889	1890	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.	1889.	1890	Increase.	Decrease.
Adair	8931	9736	805	....	969	832	....	137	19	22	3	....	30106	30291	185	.....	16111	18471	2360	....	6010	5404	.....	606
Andrain	11226	12424	1198	....	3847	3841	....	6	172	173	1	...	32837	31692	.....	1145	21957	29218	7261	...	9598	14570	4972	....
Clark	8697	9890	1193	....	1122	1172	50	...	19	22	3	..	24445	24494	49	....	12317	16760	4443	..	7442	6499	....	943
Knox	9030	9843	813	....	1091	918	....	173	32	32	...	..	25803	25266	.....	537	20835	19812	.....	1023	6392	5020	.....	1372
Lewis	8465	9048	583	....	1706	1699	..	7	67	54	...	13	22020	21747	...	273	17488	21340	3852	....	10114	11593	1479	....
Lincoln	6896	8327	1431	....	1413	1705	292	....	53	61	8	...	23143	23607	464	.....	26061	33921	7860	..	7811	8885	1074	....
Linn	11397	11937	540	..	1418	1225	....	193	30	29	...	1	40950	39813	....	1137	19607	23534	3927	...	7616	7971	355	....
Marion	14245	15853	1608	...	3678	3399	....	279	149	199	50	....	45526	46746	1220	..	36590	43120	6530	...	9121	9704	583	....
Macon	7800	8369	569	....	1216	1147	....	69	27	26	....	1	17478	16553	.....	925	19240	20138	898	....	7575	9169	1594	....
Monroe	10808	11598	790	....	3929	3769	..	160	211	237	26	....	30743	26473	.....	4270	29813	31220	1407	....	16596	18576	1980	....
Montgomery	6635	6925	290	....	2089	2074	....	15	53	55	2	....	18826	18246	.....	580	20031	23452	3421	....	6903	7630	727	....
Pike	8298	9776	1478	....	2391	2358	....	33	104	126	22	....	27512	26691	....	821	18767	27164	8397	....	12555	13167	612	....
Putnam	10044	11037	993	....	1206	984	....	222	34	36	2	....	37798	44681	6883	.....	17946	25909	7963	...	10725	10745	20	....
Ralls	6383	6593	210	....	1640	1628	....	12	63	70	7	..	23264	22440	.....	824	20852	22350	1498	....	7869	7433	...	436
Schuyler	7411	8463	1052	....	726	553	....	173	24	27	3	...	23706	23477	.....	229	12736	13973	1237	...	22095	23890	1795	....
Scotland	.....	....	...	....	.....	.....	..	....	....	....	....	...	....	.....	.....	.....	.....	....	......	...	....	......	......	....
Shelby	9464	10719	1255	..	2294	2446	152	...	81	108	27	....	24489	24160	.....	329	31160	35852	4692	....	10344	13269	2925	....
St. Charles	5474	6867	1393	..	3398	3375	...	23	27	16	...	11	15143	15462	319	.....	25938	29024	3086	....	4885	5014	129	....
Sullivan	11443	12904	1461	..	1624	1320	....	301	36	52	16	....	52404	49970	......	2434	18687	24393	5706	....	8546	9123	577	....
Warren	8587	8820	233	...	1820	1816	....	4	15	20	5	...	12855	12534	....	321	16026	17887	1861	....	5478	5353	......	125
Total	166234	184129	17895	...	87577	86261	494	1810	1216	1365	175	26	529048	524343	9120	13825	401162	477038	76899	1023	177175	192515	18822	3482
Total increase or decrease	......	....	17895	....	.....	....	....	1316	....	...	149	...	....	....	....	4705	....	....	75876	...	.....	....	15340	....

SOUTHEAST MISSOURI.

Bollinger	3936	4142	206	...	1407	1521	114	...	88	96	...	12	13372	14118	746	.....	20036	20312	....	814	7888	7804	506	...
Butler	1717	1813	96	....	687	610	...	27	15	9	...	6	8925	10393	1468	.....	16058	13678	.....	2380	1124	1001	....	123
Cape Girardeau	5564	5686	122	...	2146	2141	...	5	44	47	8	...	13109	12685	...	424	30342	30781	439	..	9206	8869	.....	337
Carter	884	797	.....	87	455	425	...	30	4	12	8	...	4253	4597	344	.....	5649	4671	....	978	668	553	...	115
Crawford	3266	3895	629	...	1638	1786	148	...	53	62	9	....	13398	16380	2982	.....	14741	16342	1601	..	7776	8935	1159	....
Dent	3323	3464	141	...	1258	1260	2	...	35	29	...	6	14852	16342	1490	.....	16869	20125	3256	...	9156	10202	1046	....
Dunklin	3698	3590	.....	108	1792	1793	1	...	23	16	...	7	16212	16004	.....	208	19870	24639	4769	....	1259	691	......	568
Franklin	6647	6776	129	...	3343	3288	....	55	35	54	19	....	21030	21247	217	......	30791	34507	3716	...	7488	7407	.....	81
Gasconade	2795	2974	179	....	2052	2088	36	...	20	19	....	1	11916	11858	....	58	13411	15271	1860	...	5349	5234	....	115
Howell	3765	4007	242	....	1756	2481	725	....	81	80	...	1	18902	20240	1338	.....	23855	24780	925	...	6075	5849	.....	226
Iron	1562	1617	55	....	763	757	....	6	4	8	4	...	5846	6765	919	.....	6561	6765	204	...	2977	2193	....	784
Jefferson	4890	5000	110	...	2412	2323	...	89	27	29	2	....	16437	16292	......	145	19895	22739	2844	...	5533	5876	343	...
Madison	2489	2457	.....	32	850	877	27	...	42	35	...	7	8474	8533	59	......	11741	11923	182	....	3407	3425	18	....
Mississippi	1946	2051	105	...	2417	2620	203	...	14	20	6	...	9390	9750	360	.....	13585	13592	7	...	206	229	23	....
New Madrid	1634	1678	44	...	1785	1737	...	48	13	15	2	...	8554	9027	473	.....	13307	13057	.....	250	619	512	......	107
Oregon	2029	2993	964	...	807	1136	329	...	10	14	4	...	9317	15031	5714	.....	16601	22845	6244	....	2599	3445	846	....
Perry	4195	4330	135	....	2061	2267	206	...	17	21	4	....	10367	9842	.....	525	24783	27747	2964	..	6874	7519	645	...
Pemiscot	1495	1515	20	...	847	892	45	...	8	11	3	....	7953	8739	786	.....	11042	9976	.....	1066	334	334	......	....
Reynolds	1718	1844	126	...	1016	937	...	79	10	18	8	...	9390	10684	1294	.....	12557	14186	1629	....	5384	4783	......	601
Ripley	1976	2144	168	....	838	773	....	65	8	15	7	....	10247	10930	683	.....	16138	15919	.....	219	3350	3089	......	261
St. Francois	2856	3064	208	...	1124	1146	22	....	35	47	12	....	9260	9574	374	.....	7568	8976	1408	...	2334	2317	.....	17
Ste Genevieve	2612	3608	996	....	833	845	12	...	10	14	4	....	16990	6246	......	744	10470	10291	......	179	2374	2689	315	....
St. Louis	6131	6776	645	...	4044	3859	..	185	....	...	...	....	13419	12318	......	1101	17502	21101	3599	...	2116	2167	51	....
Scott	2649	2653	4	...	2284	2341	57	....	17	18	1	....	11757	11518	......	239	19335	22715	3380		827	650	......	177
Shannon	1452	1644	192	...	635	684	49	...	5	7	2	...	7210	8265	1055	......	10580	9875	....	705	2229	1789	......	440
Stoddard	4226	4410	184	...	2044	2035	...	9	27	38	11	....	15470	15734	264	......	31693	31884	191	....	2999	2469	...	530
Texas	5722	5011	.....	711	1500	1718	218	....	60	62	2	....	22936	24079	1143	.....	27313	35747	8434	...	11146	11193	47	....
Washington	2563	2686	123	...	1335	1324	....	11	13	14	1	...	11933	14544	2611	.....	8205	10952	2747	...	3508	3857	349	...
Wayne	2996	3076	80	...	1467	1381	...	86	26	33	7	...	13987	14967	980	...	19103	20300	1197	...	4071	3983	......	88
Total	90686	95701	5903	888	45546	47045	2194	695	643	722	119	40	344846	366702	25300	3444	499191	544591	51496	6066	118376	119154	5348	4570
Total increase or decrease	.....	......	5015	....	.....	......	1499	....	...	...	79	...	....	....	21856	.....	....	....	45400	...	.....	....	778	....

NORTHWEST MISSOURI.

Counties.	Horses.				Mules.				Jack stock.				Neat cattle.				Hogs.				Sheep.			
	1889.	1890.	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.	1889	1890	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.
Andrew	11814	12437	623	....	2114	2082	..	82	127	162	35	....	67688	33254	......	34434	59996	71126	11180	....	2256	2274	18	....
Atchison	9722	10378	656	....	2671	2494	....	177	57	72	15	...	37153	42151	4998	....	42969	51525	8556	...	1835	1921	86	....
Buchanan	9634	7187	.....	2447	3369	2689	....	680	67	45	...	22	20400	16500	.....	3900	26152	27812	1660	....	3186	1928	.....	1258
Caldwell	11166	11671	505	...	1393	1197	....	196	32	42	10	....	29745	28302	.....	1443	31288	38271	6983	....	15303	17485	2182	....
Carroll	12783	13650	867	...	4146	3875	....	271	64	84	20	....	38951	35182	......	3769	43640	57478	13838	...	2436	2751	315	...
Clay	7712	7587	.	125	1729	1478	....	251	65	65	...	....	23114	19865	......	3249	26149	27785	1636	...	5045	5111	66	....
Clinton	9583	10763	1180	....	2026	1947	...	79	52	57	5	...	36409	33460	....	2949	44009	55233	11224	...	5875	5793	......	82
Daviess	14164	15674	1510	....	2017	1744	....	273	56	78	22	...	44042	42089	.....	1953	42151	58192	16041	...	18024	12045	.....	979
De Kalb	9445	10083	638	....	1263	1086	....	177	32	35	3	...	28984	27332	....	1652	24972	32481	7509	....	3089	3104	15	....
Gentry	12205	13666	1461	....	1772	829	...	943	50	50	....	...	39465	42870	3405	....	29259	41766	12507	....	8458	8265	......	193
Grundy	8009	8756	747	...	1129	918	...	211	40	35	....	5	33073	30338	......	2735	15327	19730	4403	..	15739	13980	.....	1759
Harrison	16163	18329	2166	....	2010	1807	....	203	70	59	...	11	63142	61312	.....	1830	39441	62745	23304	....	11170	12194	1024	....
Holt	7547	8206	659	....	2226	2226	....	...	26	26	....	....	22708	23056	348	......	36786	38137	1351	....	526	428	....	98
Jackson	20088	19565	....	523	3891	3353	....	538	..	...	....	...	27177	29301	2124	....	35818	45176	9358	....	6331	8158	1827	....
Lafayette	10880	11748	868	....	4324	4188	...	136	72	79	7	...	27796	25625	......	2171	26600	32530	5930	...	3118	3837	719	....
Livingston	10208	11083	875	...	1497	1443	....	54	42	32	....	10	32935	31854	.....	1081	26345	37317	10972	....	12329	13409	1170	....
Mercer	9775	10886	1111	..	811	617	...	194	27	27	....	.	41874	43882	2008	.....	20744	30795	10051	...	7263	7179	.....	84
Nodaway	20444	22141	1697	....	2354	2075	...	279	42	38	...	4	64242	70807	6565	..	60118	72915	12797	...	2286	3317	1031	....
Platte	6774	7146	372	....	2055	2110	55	...	51	55	4	...	19294	18031	...	1263	23462	25615	2153	....	1944	2275	331	....
Ray	10653	11468	815	..	3943	3969	26	.	87	108	21	....	33110	33802	692	.....	36922	51415	14493	...	5714	6788	1074	....
Worth	6446	7149	703	..	447	363	..	84	27	37	10	...	20125	22691	2566	.....	15057	19672	4615	...	2463	3874	1411	....
Total	235215	249573	17453	3095	47187	42490	81	4778	1086	1186	152	52	751427	711704	22706	62429	707205	897716	190511	...	129390	136206	11269	4453
Total increase or decrease	....	.....	14358	...	....	.....	..	4697	...	....	100	....	....	....	......	39723	....	....	190511	...	......	......	6816	....

SOUTHWEST MISSOURI.

Barry	6704	7242	478	...	2340	2339	...	1	65	80	15	...	20564	20001	847	...	27781	37890	10109	...	6889	6505	...	296
Barton	8768	11702	2934	...	2240	2228	...	12	66	64	...	2	33396	34604	1208	...	18096	28391	8296	...	3397	3 95	198	...
Bates	15518	16813	1295	...	3339	3128	..	211	101	98	..	3	34808	35267	459	...	30478	47937	17459	...	4072	3367	...	705
Cass	14455	15325	870	...	2714	2593	...	121	74	84	10	...	29810	33 49	4139	...	46257	69288	23031	...	2918	3438	520	...
Cedar	7460	7910	450	...	2054	1852	...	202	59	71	12	...	22080	19551	..	2529	26088	31687	5599	...	4771	4147	...	624
Christian	5104	5928	824	...	1425	1464	39	...	56	49	...	7	15774	14926	1152	..	24075	28982	4907	...	3177	3355	178	...
Dade	7996	8885	889	...	2211	2373	162	..	45	53	8	..	24138	22446		1692	27685	37750	10065	...	4356	4410	54	...
Douglas	4281	4323	42	...	959	861	...	98	33	29	..	4	13696	14786	1090	..	20415	25625	5210	...	5770	4963	...	807
Greene	11671	12897	1226	..	3476	3420	..	56	80	81	1	...	25871	25098	...	773	34762	40411	5449	...	5083	5187	104	...
Henry	11909	12680	771	...	2604	2582	..	22	66	88	22	..	28295	29135	840	...	28532	41150	12618	...	2742	2936	194	...
Jasper	12375	16260	3885	...	2763	2892	129	...	39	38	.	8	32008	33228	1220	...	22913	34085	11172	...	4540	5028	488	...
Johnson	11517	12598	1081	...	3311	3492	181	..	68	91	23	.	25168	26528	1363	...	35453	53658	18205	...	3191	5184	1993	...
Lawrence	9055	9419	364	...	3245	3245	...	..	74	63	.	11	23740	21134	...	2606	28058	33451	5393	...	4146	3660	...	486
McDonald	4065	4153	88	...	1280	1367	87	..	25	23	.	2	12421	11990	...	431	18149	22242	4093	..	5339	5272	...	67
Newton	7911	8323	412	...	1740	1632	..	108	32	38	6	...	21535	20051	...	1484	17440	20737	3297	...	3429	2945	...	484
Ozark	...	...	...	...	...	...	...	..	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...
Polk	9162	9405	243	..	3231	3478	247	...	137	153	16	...	25433	23749	...	1684	28792	36079	7287	...	10004	9503	...	501
St Clair	9520	11138	1618	..	1754	1622	...	132	45	36	..	9	30341	26357	...	3984	27972	35796	7824	...	5078	4544	...	534
Stone	2560	2427	..	133	914	820	..	94	32	34	2	...	11011	10077	...	934	13385	14811	1426	...	3207	2549	...	658
Taney	2754	2884	130	..	720	722	2	..	25	25	...	...	12568	12080	...	488	12930	13032	302	...	2623	1844	...	779
Vernon	15128	15841	713	...	3486	3494	8	..	136	154	18	...	38552	33668	..	4884	28978	35644	6666	...	2646	2334	...	312
Webster	5413	5729	316	...	2011	2259	248	..	57	64	7	...	16096	16905	809	...	17066	25552	8486	...	8489	9420	931	...
Wright	4831	5122	291	..	1335	1378	43	...	47	43	...	4	16076	16934	858	...	18919	26576	7657	...	8894	9327	433	...
Total	188212	207004	18925	133	49152	49241	1148	1057	1862	1457	140	45	511866	503362	18485	21489	554218	738774	184556	...	104756	103591	5088	6253
Total increase or decrease	...	...	18792	.	...	...	89	...	..	...	95	...	...	...	...	8004	...	...	184556	...	...	...	...	1165

CENTRAL MISSOURI.

Counties.	Horses.				Mules.				Jack stock.				Neat cattle.				Hogs.				Sheep.			
	1889.	1890.	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.	1889	1890	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.	1889	1890.	Increase.	Decrease.	1889.	1890.	Increase.	Decrease.
Benton	7227	7354	127	...	1782	1653	...	129	72	76	4	....	26330	26816	486	.....	19158	27735	8577	...	6638	6857	219	....
Boone	7902	9250	1348	...	3246	3517	271	....	140	176	36	....	20349	21280	931	.....	22675	26678	4003		8349	9855	1506	...
Callaway	9282	10193	911	...	4136	4134	...	2	209	220	11	...	25637	24133	.....	1504	27430	25519	.....	1911	19560	20344	784	...
Camden	3702	3878	176	...	1068	1091	23	...	18	23	5	...	16760	16160	.....	600	16512	19632	3120	....	5539	5341	......	198
Chariton	10264	12427	2163	...	3304	3209	...	95	77	92	15	...	37451	36868	.....	583	35678	46474	10796	...	6029	6990	961	...
Cole	3447	1697	.....	1750	1385	1266	...	119	23	18	....	5	10007	6159	.....	3848	14130	13701	....	729	6534	3562	......	2972
Cooper	7497	7386	.....	111	3698	3738	40	....	85	133	48	....	21234	20461	.....	773	32564	41874	9310	..	17409	15814	....	1595
Dallas	5451	5765	314	...	1538	1579	41	...	51	45	...	6	18664	17512	.....	1152	17621	24281	6660	..	8152	7631	.....	521
Hickory	5160	5320	160	...	1146	1143	...	3	26	42	16	...	17738	15799	.....	1939	16975	18892	1917	..	5731	5849	118	....
Howard	5540	6222	682	...	2540	2731	191	....	67	72	5	...	16775	17047	272	.....	24068	28023	2955	....	9726	11271	1545	....
Laclede	5375	5430	55	...	1325	1320	...	5	37	45	8	...	18971	18652	.....	319	20260	24360	4100	...	6266	5812	....	454
Maries	3226	3304	78	...	1698	1706	8	...	48	30	...	18	16242	16660	418	....	17193	20278	3085		7745	8196	451	....
Miller	4299	4981	682	...	1780	1955	175	....	28	23	...	5	19754	19578	.....	176	26427	31187	4760	...	9979	9617	...	362
Moniteau	6382	6652	270	...	2337	2143	...	194	64	70	6	...	17702	14885	......	2817	30022	32102	2080	..	6143	6603	460	....
Morgan	4744	4991	247	...	1926	1914	...	12	81	86	5	...	17077	16736	.....	341	12820	18726	5906	....	7926	8830	904	....
Osage	3144	3419	275	...	2837	2935	98	....	29	31	2	...	14827	13513	.....	1314	17318	22053	4740	...	7166	7770	604	....
Pettis	10067	11104	1037	...	3036	2920	...	116	76	...	...	76	30127	30505	378	.	23583	31463	7880	...	5752	10368	4616	....
Phelps	3576	3528	.....	48	1201	1165	...	36	70	82	12	...	14896	14784	.....	112	14650	17325	2675	...	7320	8389	1069	...
Pulaski	3181	3322	141	...	811	826	15	...	12	14	2	...	14215	12779	.....	1436	17479	19767	2288	..	5232	5208	......	24
Randolph	7814	8447	633	...	2170	2010	...	160	135	146	11	...	20822	19594	.....	1228	16667	21566	4899	...	9647	15291	5644	....
Saline	12553	12094	.....	459	5730	5599	...	131	185	168	...	17	38359	40429	2070	.....	30235	40522	10287	....	5556	6814	1258	...
Total	129833	136764	9299	2368	48694	48554	862	1002	1536	1595	186	127	433937	420350	4555	18142	453760	552158	101038	2640	172399	186412	20139	6126
Total increase or decrease	.....	...	6931	...	.....	.....	...	140	...	...	59	...	....	....	.....	13587	....	....	98398	...	.....	....	14013	....

SUMMARY.

	Horses 1889	Horses 1890	Horses Increase	Horses Decrease	Mules 1889	Mules 1890	Mules Increase	Mules Decrease	Jack stock 1889	Jack stock 1890	Jack stock Increase	Jack stock Decrease	Neat cattle 1889	Neat cattle 1890	Neat cattle Increase	Neat cattle Decrease	Hogs 1889	Hogs 1890	Hogs Increase	Hogs Decrease	Sheep 1889	Sheep 1890	Sheep Increase	Sheep Decrease
Northeast	166234	184129	17895	....	37577	38961	....	1316	1216	1365	149	....	529048	524343	......	4705	401162	477038	75876	...	177175	192515	15340	....
Northwest	235215	249573	14358	....	47187	42490	..	4697	1086	1186	100	....	751427	711704	.....	39723	707205	897716	190511	....	129390	136206	6816	....
Southeast	90686	95701	5015	...	45546	47045	1499	...	643	722	79	..	844846	866702	21856	......	499191	544591	45400	....	118376	119154	778	...
Southwest	188212	207004	18792	....	49152	49241	89	..	1362	1457	95	..	511366	503362	.....	8004	554218	738774	184556	....	104756	103591	.....	1165
Central	129833	136764	6931	....	48694	48554	....	140	1536	1595	59	....	433937	420350	.....	13587	453760	552158	98398	....	172399	186412	14013	....
State	810180	873171	62991	....	228156	223591	....	4565	5843	6325	482	....	2570624	2526461	......	44163	2615536	3210277	594741	....	702096	737878	35782	....

ST. LOUIS AS AN INTERMEDIATE LIVE-STOCK MARKET.

From Evans, Snider, Buel Co.'s Souvenir of the National Stock Yards.

In addition to the strong claims which are advanced in favor of the St. Louis National stock-yards as a natural consuming center for stock raised or fattened in the country directly tributary to the city, it also has the first place in merit as an intermediate market between the great ranch and stock-farming districts of the Southwest and the centers of consumption in the East, and is the more important because the railroads leading eastward from this city can place the live-stock or dressed product on the eastern seaboard at less cost and in less time than if shipped *via* any other market receiving southwestern stock.

If a train of cattle is shipped from Northern Texas to St. Louis, and is sold here and transported alive to New York, it reaches the eastern seaboard sooner and at less cost than if the cattle are shipped to and sold at Chicago, and re-shipped East alive.

The conditions are even more favorable to St. Louis when the cattle are killed here and shipped eastward in refrigerator cars. This is a natural advantage St. Louis has in the matter of location, and there is a saving in distance, a saving in shrinkage and a saving in charges. Consequently, as all shrinkages and charges come out of the value of the cattle, a steer or cow or heifer generally nets more money to the shipper when sold in St. Louis than it does when sold after paying higher charges to reach Chicago.

When the cattle or sheep or hogs are offered on the St. Louis marke, tthey have all the competition which this market affords, and in addition to the rivalry in trade which exists here as elsewhere, the short distance to Chicago keeps us in closer touch with the greater market than other intermediate markets can be, and insures the owner the greatest liberty in the matter of sale, and affords him every facility for sale here without delaying his cattle longer than they would be held if at an ordinary feed station, should he finally decide not to soll the stock at this market.

Beyond the arguments already given, another and much greater one is advanced for shipping all tributary stock *via* St. Louis. The reason is that the greater market, if over supplied, depresses all the others and causes a loss in values throughout the land. The only way to prevent large accumulations of stock at the great market is to insure all supplies from a distance being offered on the lesser ones. In no instance does this call for a sacrifice on the part of the shipper. The advantage is all on his side. He obtains a double measure of competition on the one hand, and on the other is able to distribute his stock to benefit the general interest to which he is allied.

No matter how many changes may take place in the live-stock trade, the argument just presented will hold good at all times and all seasons. The shippers in their own interest must sell all the products they can at the intermediate markets and let the surplus go on to the greater market, no matter where, in the future, that market may be. No man can determine the quantity of stock to be offered on the market in advance of its coming, and if by avoiding an intermediate market he leaves that market short of supplies, he helps to overstock a greater market, and he may find that he has injured himself, and has also injured his fellows in the business by assisting in producing a condition which for the day may reduce the values of their stock.

The St. Louis National stock-yards has furnished an active market for all classes of fat-stock for seventeen years, and if shippers will study their interests closely they will find that the market can do much more to aid them in the conduct of their business.

Receipts and Shipments of Live Stock at St. Louis for 1890.

Route.	Receipts.				Shipments.			
	Cattle...	Horses & mules...	Hogs...	Sheep...	Cattle...	Hogs...	Sheep...	Horses & mules...
Chicago & Alton R.R.(Mo. Div.)	15712	4198	80437	4458	243	.....	67	250
Missouri Pacific R. R....... ..	45747	15746	205618	36564	2270	1562	182	679
St. Louis & San Francisco R.R.	223274	3248	168337	123032	722	84	524	2003
Wabash R. R. (West).........	145760	29712	382107	57635	846	.....	1245	876
St. L. Kas. City & Colo. R. R..	743	1	4791	259	......	.....	.....	.....
St. Louis, Arkansas & Tex. R.R	.....	.....	....	198	......	79	......	45
St. Louis, Iron Mountain & Southern R. R.........	89917	3820	41371	61609	886	3	1221	10462
Missouri, Kansas & Texas Div.	42025	1539	12939	13603	45	.....	...	77
St. L., A. & T. H. R. R. (Cairo Short Line)........... ...	17421	438	76223	8875	173	996	863	1379
Illinois Central R. R	....	100	212	64	197	266	....	4810
Louisville & Nashville R. R...	4385	1455	46177	4137	840	190	8363	23906
Mobile & Ohio R. R..........	4770	252	24337	5758	166	75	109	4852
Ohio & Mississippi R. R.......	1748	1381	29717	1951	2413	6651	8931	6888
Chicago & Alton R. R.........	6942	3051	47025	6505	143725	50220	67823	1127
Cleveland, Cin., Chi. & St. L..	1877	1587	20668	1870	79163	479019	26088	5299
Vandalia & Terre Haute R. R.	2863	452	15210	5265	21197	115742	63996	8744
Wabash R. R. (East)..........	2065	123	31769	1769	105531	10224	50617	2595
Toledo, St. L. & Kas. City R.R.	790	88	10272	1385	132	60	1041	51
Louisville, Evansville & St. L..	292	90	4791	1121	846	......	18363	773
St. Louis, Alton & Springfield R. R......................	199	......	1932	74	....	.....	134	......
Chicago, Burlington & Quincy	1566	1157	31463	1996	1785	57	350	478
Keokuk & St. Louis R. R......	8068	11786	33274	4326	68	......	.....	182
Upper Mississippi river.......	3917	1282	19778	1424	457	243	176	3554
Lower Mississippi river.......	6916	428	35720	7207				
Illinois river	865	48	12097	780				
Missouri river................	544	46	14612	325				
Ohio, Cumberland & Tennessee rivers.	138	21	632	27				
Driven and Express	10470	22	8280	6279				
Totals	639014	82071	1359789	358496	361705	665471	251728	79030

Receipts and shipments of live stock at the St. Louis National Stock-yards for year 1890.

Month.	Receipts.					Shipments.				
	Cars....	Cattle...	Hogs...	Sheep...	Horses & Mules..	Cars....	Cattle...	Hogs....	Sheep...	Horses & Mules..
January..........	2728	25998	100725	10987	2612	818	10479	29899	5892	2103
February	1869	20975	60642	7515	1817	710	8616	31358	3504	1544
March............	2162	24220	78383	14731	1269	993	11967	49814	8164	1085
April..............	2476	27706	91631	15968	859	1257	15474	64122	13011	846
May..............	3435	44121	104921	31662	1979	1358	28834	69382	28016	1847
June..............	4192	73765	75382	47047	1825	2763	54410	45371	37005	1525
July..............	4071	69335	80820	37588	2255	2574	49738	50773	32196	2280
August............	2704	44838	53372	39807	2137	1521	27991	32122	31803	2136
September..........	2866	50033	50157	26084	1772	1744	31519	42935	18252	1759
October............	3418	55014	77000	26516	2190	2018	36489	53155	17898	2125
November	2885	42976	73971	14911	1781	1458	26464	35865	9485	1659
December..........	2519	31774	78476	9579	1251	1065	17045	31448	6525	1251
Totals............	35325	510755	925480	282206	21747	18909	319026	536244	211651	20260

Receipts and shipments of live stock at the St. Louis Union Stock-yards for year 1890.

Month.	Receipts.				Shipments.			
	Cattle...	Hogs....	Sheep....	Horses & Mules..	Cattle....	Hogs....	Sheep...	Horses & Mules..
January......	8917	44658	3120	6945	1546	12148	90	75
February	7428	27759	3969	4996	926	5839	197	121
March	8424	31063	2863	2839	1031	146	217	321
April............................	9006	39510	3276	2091	1166	7017	.....	39
May	10307	39353	4303	1802	1291	16716	663	116
June............................	8195	29747	6907	1308	235	9066	3257	37
July	8993	27150	9540	986	1257	5249	4810	39
August..	8651	25562	12106	1365	1388	5036	8456	56
September........................	13073	28049	6910	2200	3064	5658	2644	64
October..........................	13701	41988	7029	2677	3615	13382	2803	80
November	9897	41589	5301	2411	2162	12148	1808	25
December........................	9676	47534	2860	3458	2335	9701	435	271
Totals..........................	116268	423962	68184	33078	20016	102109	25380	1244

Weekly prices of live stock for 1890.

Date.	Cattle.		Sheep.	Hogs.		
	Native steers.	Texas steers.	Good to choice.	Yorkers.	Packers.	Butchers.
Jan. 1..	3 50@4 75	2 80@2 90	4 00@4 70	3 50@3 60	3 60@3 65	3 65@3 70
8..	3 45 4 65	2 50 3 40	4 15 5 40	3 45 3 50	4 45 3 55	3 55 3 60
15..	3 50 4 35	2 45 3 00	4 25 5 50	3 50 3 60	3 55 3 65	3 60 3 70
22..	3 50 4 35	2 70 3 85	4 25 5 80	3 60 3 70	3 65 3 75	3 70 3 80
29..	3 75 4 75	2 65 3 40	4 50 6 00	3 65 3 75	3 75 3 85	3 85 3 90
Feb. 5..	3 50 4 40	2 20 2 80	4 50 6 00	3 70 3 80	3 80 3 90	3 95 4 00
12..	3 35 4 45	3 00 3 30	5 00 6 00	3 80 3 95	3 90 4 00	4 00 4 10
19..	3 65 4 65	2 70 3 60	4 65 5 75	3 80 3 90	3 80 3 85	3 90 3 95
26..	3 35 4 30	3 05 3 40	4 75 5 75	3 80 3 90	3 80 3 90	3 90 3 95
Mar. 5..	3 00 4 62½	2 75 3 55	4 25 5 50	3 85 3 95	3 90 3 95	3 95 4 00
12..	3 25 4 45	2 75 3 75	4 25 5 37½	3 90 3 97½	3 95 4 00	4 00 4 05
19..	3 25 4 50	2 75 3 70	4 75 5 75	4 00 4 10	4 05 4 10	4 10 4 15
25..	3 20 4 70	2 75 3 80	5 00 5 50	4 05 4 15	4 00 4 25	4 15 4 25
April 2..	3 30 4 40	2 60 3 65	4 50 5 50	4 15 4 20	4 10 4 20	4 20 4 22½
9..	3 50 4 80	2 80 3 90	4 25 5 75	4 15 4 20	4 15 4 25	4 25 4 32½
17..	3 50 4 80	3 00 3 80	4 50 5 75	4 10 4 15	4 15 4 20	4 25 4 27½
24..	3 70 4 60	2 50 4 00	4 25 5 65	4 05 4 10	4 00 4 15	4 15 4 20
30..	3 50 4 65	2 75 3 70	4 00 5 37	4 10 4 15	4 00 4 15	4 15 4 20
May 7..	4 15 4 85	3 10 3 80	4 00 5 12½	4 00 4 10	3 95 4 10	4 10 4 15
14..	3 90 5 05	3 00 4 70	4 25 5 50	4 00 4 05	4 00 4 05	4 05 4 10
21..	3 50 4 90	2 50 4 00	4 00 5 00	3 90 3 95	3 75 4 00	3 90 4 00
28..	3 85 4 75	2 50 4 00	4 00 5 25	3 80 3 90	3 80 3 90	3 90 3 92½
June 4..	3 40 4 90	2 65 3 90	4 25 5 12½	3 60 3 70	3 60 3 70	3 70 3 75
11..	3 40 4 85	2 70 4 30	4 25 5 00	3 60 3 70	3 65 3 75	3 70 3 80
18..	3 80 4 70	3 00 3 75	4 00 5 37½	3 60 3 70	3 60 3 70	3 70 3 75
25..	3 00 4 75	2 15 3 40	4 00 5 00	3 65 3 70	3 65 3 72½	3 70 3 75
July 2..	3 40 4 85	2 10 3 45	4 00 4 75	3 55 3 60	3 55 3 60	3 60 3 65
9..	3 25 4 20	2 00 3 10	3 75 4 75	3 80 3 90	3 85 3 90	3 90 3 92½
16..	3 25 4 35	2 20 3 35	4 00 5 12½	3 60 3 65	3 65 3 70	3 70 3 80
23..	3 00 4 40	2 00 3 25	3 75 5 60	3 70 3 75	3 75 3 80	3 80 3 82½
30..	3 25 4 25	2 25 3 30	4 00 5 00	3 75 3 85	3 75 3 85	3 85 3 87½
Aug. 6..	3 00 4 80	2 00 3 12½	4 00 5 00	3 60 3 70	3 65 3 70	3 70 3 75
13..	3 40 4 75	1 95 3 25	4 00 5 00	3 80 3 90	3 85 3 90	3 95 3 97½
20..	3 50 4 60	2 00 3 00	4 00 4 75	3 80 3 90	3 90 4 00	4 95 4 00
27..	3 50 4 80	2 20 3 35	4 00 4 50	3 90 4 10	3 90 4 10	4 15 4 20
Sept. 3..	3 55 4 70	2 00 3 20	4 00 4 75	4 20 4 30	4 00 4 25	4 30 4 40
10..	3 75 4 87½	2 30 3 45	4 00 4 75	4 30 4 45	4 30 4 45	4 45 4 60
17..	3 25 4 80	1 90 3 00	4 00 4 85	4 55 4 60	4 50 4 60	4 60 4 70
24..	3 60 4 90	2 10 3 40	4 00 4 75	4 40 4 50	4 40 4 50	4 50 4 55
Oct. 1..	3 75 4 85	2 00 3 15	4 00 4 75	4 20 4 30	4 25 4 35	4 30 4 40
8..	3 35 4 90	2 30 3 40	3 75 4 85	4 30 4 40	4 30 4 40	4 00 4 45
15..	4 10 4 70	1 90 3 35	4 25 5 25	4 20 4 25	4 20 4 25	4 35 4 40
22..	3 25 4 90	2 10 3 37½	4 00 5 00	4 10 4 20	4 15 4 25	4 22½ 4 30
29..	3 40 4 75	1 65 3 55	4 00 5 00	3 70 3 90	3 90 4 00	3 90 4 00
Nov. 5..	3 70 4 70	1 75 3 40	4 00 5 00	5 80 4 00	3 95 4 10	4 10 4 17½
12..	3 70 4 80	2 30 3 50	4 00 5 12½	3 60 3 70	3 75 3 80	3 80 3 90
19..	3 50 5 00	1 95 3 15	4 00 5 00	3 30 3 40	3 50 3 60	3 60 3 75
26..	3 50 5 00	2 20 3 15	4 00 4 65	3 70 3 80	3 80 3 85	3 85 3 90
Dec. 3..	3 40 5 05	2 40 3 30	4 25 5 25	3 20 3 30	3 40 3 50	3 55 3 60
10..	3 50 6 50	2 05 3 30	4 00 5 00	5 25 3 30	3 40 3 50	3 50 3 65
17..	3 45 5 60	2 40 2 60	4 40 5 40	3 10 3 15	3 15 3 35	3 40 3 45
24..	3 65 5 05	2 40 3 25	4 50 6 00	3 10 3 30	3 30 3 45	3 50 3 50
31..	3 35 5 00	1 85 3 30	4 50 5 60	3 25 3 30	3 40 3 55	3 60 3 70

MORE MONEY IN CATTLE.

Special Correspondence of the Globe-Democrat.

WASHINGTON, D. C., March 11.

Better prices for cattle are predicted by the Department of Agriculture. There are several reasons given for this. The marketing has been excessive for the past two years. Several big ranges, notably those in the Indian territory, have been cleared out. Last year twice as many calves were sold at the Chicago live-stock yards as during the previous year. The same is true as regards the cattle. The producing capacity of the American herds has been reduced. These are facts well known to stockmen. They have been the subject of much comment in live-stock journals recently. To these conditions is added another, which will have considerable influence on the cattle markets of the near future. The increase in cattle and dressed beef exports is already beginning to make itself felt. The Vest inspection law is being vigorously enforced. Not many people know that last year the United States sold foreign consumers $30,000,000 worth of beef more than was sold in 1888. This is something that counts. In 1889 the exports of cattle and beef products were $9,000,000 more than they were in 1888. In 1890 they were $21,000,000 more than they were in 1889. And this swelling demand for American beef abroad continues.

WHAT DOES IT.

Chief Statistician Brock, of the Treasury department, said to-day, when asked about the exports of cattle: "Our returns show considerable increase in this trade. If we may judge from the figures, our foreign cattle trade is not only healthy, but it is increasing at a rate that is most gratifying."

"When did this increase set in?"

"During two years of this administration it has been very marked."

"How do you account for it?"

"Just by the fact that Secretary Rusk, of the Department of Agriculture, backed by the President, has taken special interest in this branch of our foreign trade. He has been at great pains to watch and enforce the execution of the law in relation to the inspection of all cattle shipped to Europe. You are aware that there has been a great prejudice in Great Britain, which is our best market, against American cattle and more especially against cattle shipped from the United States. This prejudice has been encouraged by the cattle raisers of Great

Britain as well as by officials, because they could not compete with the American product, consequently there have been unjust discriminations against the cattle shipped from the United States. No restrictions are placed upon cattle from Canada, while under the British laws all cattle coming from the United States must be slaughtered within ten days, or before they have recovered from the damage of the long and fatiguing trip. There has been a disposition to discourage the use of American beef cattle in England by the circulation of the reports that they were not healthy, but were more or less troubled with pleuro-pneumonia. This false impression has now been largely overcome by the rigid inspection directed by Secretary Rusk. The good results of the inspection are seen in the fact that during six months not a single head of cattle imported into Great Britain or to any of the European ports has been rejected. The prejudice against our beef products is being rapidly overcome. Our shipments have rapidly increased. The people of Great Britain and European countries now buy cheaper beef and use more meat products than for many years before. Our meat products are constantly growing in favor."

"To what extent have our beef exports increased, say in the past five years, Maj. Brock?"

The Statistician reached for three or four volumes of reports in the book-case by his desk as he replied, "Let me give you the exact figures."

THE SURPRISING STATISTICS.

Turning over the pages he said: "In 1885 there were shipped from the United States to foreign countries 135,890 head of cattle. Those cattle were worth $12,906,690. Now I will give you the succeeding years down to the present:

In 1886 we shipped 119,065 head, worth	$10,958,954
In 1887 we shipped 106,459 head, worth	9.172.136
In 1888 we shipped 140,208 head, worth	11,577,578
In 1889 we shipped 205,786 head, worth	16.616,917
In 1890 we shipped 394,836 head, worth	31,261,131

"Those figures are rather startling. It appears that we exported about three times as many cattle in 1890 as we did in 1886, '87 or '88, and about twice as many in 1889?"

"Yes," replied the Statistician; "the figures are rather surprising and pleasantly so. And it is extremely interesting to note the fact that there has been almost like proportionate increase in the exports of fresh dressed beef and canned beef from this country to foreign markets."

"What are the figures?"

The Statistician reached for another volume and said: "The value of the fresh and canned beef we have exported for the past four years has been as follows:

In 1886	$11,525,103
In 1887	10,082,654
In 1888	12,489,570
In 1889	16,902,488
In 1890	19,962,475

"The year 1890 appears to have been a red-letter year for us in our foreign beef trade?"

"During the year 1890, the values of our exports of beef products largely exceeded that of any prior year. The total value of cattle and beef products, including tallow, shipped during the fiscal year 1890 was $61,412,151. Our largest year prior to 1890 was 1884. In that year the value of those products exported was $41,080,000."

"We appear to have fallen off for three or four years, and then to have regained much more than we lost?"

"During the years 1885, 1886, 1887 and 1888, there was a decided falling off. In 1887 our exports of beef products, all told, amounted to only $24,690,018. The increase for 1889 and 1890 is most significant and gratifying."

"You account for this increase in part, at least, by the Government's action?"

ONE MONTH'S SHOWING.

"I think the increase is due largely to the special efforts being made by the administration to facilitate the exports of those products. During the month of December last, our exports of cattle amounted to $3,179,964. Of beef products, we sent abroad that month $4,145,633, a total of $7,325,597. So you see in one month of 1890 our exports in this line amounted to nearly one-half of the cattle and beef products exported in the entire year of 1887."

"Will this foreign demand continue?"

"Of course this is not certain. The indications are that it will. The people of Europe are now enabled to, and in fact do, eat more meat than formerly. The supply of good American beef is a great blessing to them. They are not likely to give it up readily, now that they have acquired a taste of it."

"What will be the effect of this growing demand for American beef abroad? Will the stock-raisers of this country realize any appreciable benefits from it?"

"Undoubtedly our live-stock interests will be helped very much. The direct results of an export of $61,412,157 worth of cattle and beef products in a single year cannot but benefit the farmers. The cattle trade for five or six years has been quite dull and prices have been very low. It is a law of trade, as everybody knows, that as the demand increases the prices advance. As you can see by the figures I have given, this cattle trade was very much depressed in 1886, 1887 and 1888. In 1889 it greatly improved. That year the exports of cattle were $5,039,330 more than in 1888, while the beef products were $4,419,547 more. The total increase was $9,458,885. Then last year, 1890, the increase over 1889 was still greater, amounting to $21,933,099. Of this the marked increase was in live cattle, which was in value $14,644,214."

"Can you reduce the cattle and beef exports to numbers?"

THREE-QUARTERS OF A MILLION HEAD.

"Yes. The number of cattle represented in the shipments of beef on the hoof and in various products in 1890 was about 750,000 head. You can see such a demand, with an increasing market, must bring better prices, and the farmers cannot be prevented from getting a share of the profit. These increases in values do not come to the farmers as quickly as they should, because butchers and packers and shippers, all middle men, in fact, do not raise prices ordinarily until the demand upon them for stock is such that they are compelled to pay more to the producer. In other words, they buy low as long as they can, so that the producer is the last to feel the benefit of higher prices. However, better prices have come now to the cattle-raisers. Probably the prices will continue to advance some. There are other reasons besides this growing demand for export why the value of cattle should advance. The ranges are being narrowed by settlement. Sheep are scarcer and in greater demand. They will not be so freely butchered, as wool-growing will now be more profitable because of the new tariff. Less mutton and more beef will be used in our home markets. I see by a number of weekly papers from Missouri that the prices of cattle among the farmers are now steadily advancing. At the town and neighborhood sales better returns are being realized. It is evident the farmers are already beginning to feel the improvement to which they are entitled. One thing is very certain, the farmers have no friend who is more diligently and carefully looking after their interests than Secretary Rusk, of the Department of Agriculture. This I know from the frequent inquiries at this bureau regarding the exports of provisions, and especially of cattle. Secretary Rusk is watching our increasing exports of cattle and beef products very closely." W. B. S.

COMPARATIVE BUSINESS IN LEADING ARTICLES AT ST. LOUIS.

The following tables are from the report of Geo. H. Morgan, Secretary Merchants' Exchange, St. Louis, for the year 1890:

Articles.	1887.	1888.	1889.	1890.
Flour, amount manufactured, brls.	1,985,717	2,016,619	2,066,442	1,872,005
Flour, " handled, brls......	3,633,194	3,973.155	4,249,261	4,313,567
Wheat, total receipts, bushels.....	14,510,313	13,010,108	13,810,591	11,730,774
Corn, " "	16.576.386	20.269,499	34,299,781	45,003,681
Oats, " "	9.768,545	10,456,760	11,347,340	12,229,955
Rye, " "	236,726	421,514	679,364	501,054
Barley, " "	2,932,192	3,044,961	3,070,807	2,794,880
All grain received, including flour reduced to wheat, bushels.	48,748.562	51,195,121	68,466,596	77,795,232
Cotton, receipts, bales.............	520,063	521.156	544.189	587,187
Bagging, manufactured, yds.. ...	15,000,000	12,000,000	13,000,000	12,000.000
Hay, receipts, tons................	85.394	107.884	116,346	114,092
Tobacco, receipts, hhds......... ...	37,592	27,140	38,082	37,558
Lead, receipts in pigs 80 lbs., pigs.	1,432,054	1,853,781	2,018,483	1,756,850
Hog product, total shipments, lbs.	220,613.987	246,238,457	314,810,593	379.346,147
Cattle, receipts, head.............	464,828	546,875	508,190	630,014
Sheep, " "	417,425	456,669	358,495	358,496
Hogs, " "	1,052.240	929,230	1,120,930	1,359,789
Horses and mules, receipts, head..	57,048	58,458	78,104	82,071
Lumber and logs, " feet...	675,144,047	627,226,966	670,862,165	681,810,588
Shingles, " pcs ...	77,288,735	66,285,500	111,080,500	64,173,150
Lath, " " ...	43,334,705	14,650.317	21,386,350	16,336,650
Wool, total receipts, pounds.......	17,347.186	19,626,629	21,018,920	20,540,503
Hides, " "	26,175,972	31,814,049	29,732,042	28,245,828
Sugar, received, "	105,670,926	138.561.200	150,262,050	140,281,225
Molasses, shipped, galls...........	1,952,265	3,807,070	2,131,080	2.467,060
Coffee, received, bags............	184,312	192,940	211,789	222.765
Rice, receipts, pkgs..............	79,604	74,181	63.653	115,970
Coal, " bush...............	66,524.025	67,676,875	65,403,025	69,477,225
Nails, " kegs	706,472	596,579	467,943	471,352
Potatoes " bush..	1.301,636	1,219,893	992,919	1,476,913
Salt, " brls	394,676	330,110	293,663	326,189
Salt, " sacks......	32,060	24,649	21,316	33,848
Salt, " bush in bulk........	320,490	254,700	304,080	168,030
Butter, lbs........................	9,234,043	11,109,733	12,822,101	13,661,924
Tons of freight of all kinds received and shipped....................	14,359,059	13,455,760	14,909,443	16,505,733

COTTON.

Sources of supply of Cotton received at St Louis for five years.

Shipped from	1889-90.	1888-89.	1887-88.	1886-87.	1885-86.
Arkansas	312,348	305,502	293,618	252,956	226,496
Texas	122,684	151,436	161,833	117,925	211,046
Missouri	11.609	25,546	18.106	14.274	9,726
Tennessee	26,881	28,882	21,964	14,344	10,176
Mississippi	42,750	52,183	16,098	6,418	10.656
Indian Territory	10,177	5,205	4,926	4,304	2,802
Alabama	11,628	15,090	3,251	54	....
Kentucky	241	515	305	1,509	1,674
Louisiana	344	28	191	48	106
Kansas	248	185	....	....	....
Total bales	538,910	584,752	520,292	411,832	472,682

Monthly receipts and shipments for three seasons.

Months.	1889-90.		1888-89.		1887-88.	
	Receipts.	Shipm'ts.	Receipts.	Shipm'ts.	Receipts.	Shipm'ts.
September	9,970	5.117	9.166	5,651	23,699	9.046
October	76.970	50,953	119.197	80,564	101,491	72,760
November	126,960	100,093	153,965	134.724	149.342	114.908
December	153 057	112,069	130,575	96,897	120,824	111.917
January	82,920	97.630	65.848	81,202	40.007	46,825
February	51.071	63.711	45,361	59,854	27,798	32.519
March	20.313	47,659	36,165	60,713	20,295	32,987
April	12,072	33.942	14,748	40.366	15,510	28.232
May	2,965	11.729	5.340	13,427	11,046	28,990
June	1,205	4.880	2.568	6,891	5,577	26.010
July	589	7.192	1,341	3,389	3,106	10.247
August	818	720	298	1,026	1,597	4,662
Total bales	538,910	535,695	584,572	584,704	520,292	519,103

Receipts of Cotton by each route for four cotton years.

Routes.	1899–90.	1888–89.	1887–88.	1886–87.
St. Louis, Iron Mountain & Southern R. R.	258,800	289,926	273,793	233,222
Missouri, Kansas & Texas railroad.......	34.273	40,334	75,198	70,574
Mobile & Ohio railroad...	72,592	85,523	31,708	11,676
St. Louis & San Francisco railroad........	106,639	89,745	78,604	49,015
*Cairo Short Line railroad................	....	65,921	49,243	40,235
Illinois Central railroad..................	1,740	....	....	....
St. Louis, Arkansas & Texas railroad....	50,728	....	....	....
Missouri Pacific railroad..................	119	....	....	....
Louisville & Nashville railroad...........	394	410	548	692
Lower Mississippi river boats....	12,198	9,997	8,551	6,418
Cumberland and Tennessee river boats...	1,341	2,609	2.590	....
Other sources............................	86	107	57	....
Total bales.............	538,910	584,572	520,292	411,832

*Receipts by Illinois Central and St. L., A. & Texas heretofore entered as Cairo Short Line.

Highest and lowest prices of Middling Cotton each month for four years.

Months.	1889-90.		1888-89.		1887-88.		1886-87.	
	Lowest.	Highest	Lowest.	Highest.	Lowest.	Highest	Lowest.	Highest
September....	10⅜	11	9¾	10	8¾	9⅜	8⅞	9¼
October...........	9⅛	10¼	9¼	9⅝	8 11-16	9	8⅝	9 3-16
November..........	9 11-16	9⅞	9 5-16	9⅝	9 1-16	9¾	8½	8⅝
December..........	9 11-16	9¾	9 7-16	9½	9 11-16	9⅞	8⅝	9
January...........	9 11-16	10 9-16	9 7-16	9⅝	9¾	9⅞	8⅞	9
February..........	10 7-16	10⅝	9⅝	9¾	9 13 16	9⅞	8⅞	9 1-16
March.............	10⅝	11	9¾	9⅞	9½	9 13-16	9⅛	10
April.............	11	11⅜	9⅞	10 9-16	9⅜	9 7-16	10	10 3-16
May..........	11⅜	11⅞	10 11-16	10¾	9½	9 9-16	10¼	10⅞
June.........	11½	11⅞	10 11-16	10 11-16	9 9-16	9¾	10⅝	10⅞
July..	11½	11⅛	10 11-16	10¾	9⅞	10 1-16	9⅝	10⅝
August............	10⅝	11½	10¾	11	10	10⅛	9¼	9⅝

Average weight per bale (lbs).	1889-90.	1888-89.	1887-88.	1886-87.	1885 86	1884-85	1883-84.
St. Louis receipts............. ...	510 50	504.00	500.90	502 00	502.50	498.00	495 00
Crop of United States	496.13	495 79	485.35	485.87	483 95	480 70	482 66

[illegible] — RECEIPTS AND SHIPMENTS OF BUTTER AND CHEESE.

By	Butter.		Cheese.	
	Receipts, pounds.	Shipments, pounds.	Receipts, boxes.	Shipm'ts, boxes.
Chicago & Alton (Mo. Div)	4,980	....	145	507
Missouri Pacific	1,702,893	3,265	5,286	6,939
St. Louis & San Francisco	23,330	1,755	757	5,325
Wabash railway	791,987	83,162	1,657	2,307
St. Louis, Kansas City & Colorado	135	....	....	1
St. Louis, Arkansas & Texas	120	273,043	....	11,866
St. Louis, Iron Mountain & Southern	10,054	1,886,946	460	48,998
Missouri, Kansas & Texas	10,090	4,430	174	3,755
St. L., A. & T. H. (Cairo Short Line)	40,388	115,247	....	4,288
Illinois Central	2,790	369,029	10	1,817
Louisville & Nashville	355,035	46,367	276	994
Mobile & Ohio	176,195	12,943	49	6,428
Ohio & Mississippi	2,600	44,397	200	
Chicago & Alton	515,945	....	3,075	100
Cleveland, Cin., Chicago & St. Louis	44,049	63,606	1,728	832
Vandalia & Terre Haute	1,307,066	63,315	5,413	
Wabash railway	4,560,042	1,331,846	157,701	3,382
Toledo, St. Louis & Kansas City	....	40,100	45	2
Louisville, Evansville & St. Louis	39,376	3,190	2	755
St. Louis, Alton & Springfield	30	90	....	59
Chicago, Burlington & Quincy	930,580	....	1,586	710
Keokuk & St. Louis	923,523	1,300	1,597	159
Upper Mississippi river	5,050	102,768	....	9,841
Lower Mississippi river	114,700		324	
Illinois river	2,000		....	
Missouri river	14,150		10	
Ohio, Cumberland and Tennessee	1,030		....	
Express	2,083,786		....	
Total 1890	13,661,924	4,446,799	180,495	109,065
" 1889	12,822,101	4,623,378	185,414	138,699
" 1888	11,109,733	3,375,586	139,014	145,856
" 1887	9,234,043	2,221,570	109,767	106,204
" 1886	8,605,230	2,557,238	128,882	99,883
" 1885	9,739,391	2,577,328	119,831	93,841
" 1884	8,747,064	1,261,488	114,274	106,955

BEANS.

Receipts and Shipments for twenty years.

Year.	Receipts.			Shipments.		
	Castor Beans, sks	Castor Beans in bulk, bu..	White Beans, sks and brls .	Castor Beans, sks	Castor Beans in bulk, bu..	White Beans, sks and brls..
1890	2,200	160,600	58,698	....	19,000	80,182
1889	3,850	119,900	38,222	865	502	87,122
1888	4,875	105,500	37,524	3,536	7,995	97,163
1887	5,786	149,000	71,978	8,777	4,690	66,900
1886	23,345	217.500	45,420	9,626	500	56,239
1885	16,592	53,000	37,178	247	500	56,645
1884	3,969	44,000	28,766	703	6,025	33,171
1883	4,542	102,500	39,592	922	40,661	32,641
1882	6,435	264,256	24,134	685	66,004	34,064
1881	13,384	174,000	49,847	21,141	51,518	33,660
1880	9,057	285,000	25,363	9,135	22,500	17,909
1879	5,619	499,650	24,003	1,838	48,064	16,983
1878	18,876	239,500	14,846	2,907	23,435	10,259
1877	79,123	....	17,074	25,574	....	12,506
1876	69,133	....	13,033	23,723	....	11,972
1875	109,199	....	17,385	36,509	....	21,771
1874	35,257	....	13,241	10,903	....	22,806
1873	18,988	....	10,294	11,167	....	8,766
1872	24,334	....	11,952	11,435	....	12,525
1871	41,706	....	10,365	17,820	....	13,066

POTATOES AND ONIONS.

Receipts and Shipments for twenty years.

Year........	Potatoes.						Onions.		
	Receipts.			Shipments.			Receipts.		Shp'ts.
	Sacks and barrels..	Bushels in bulk.	Total in bushels.	Sacks and barrels.	Bushels in bulk.	Total in bushels	Sacks and barrels..	Bushels in bulk.	Sacks and barrels..
1890	121,773	1,111,600	1.476,919	333,767	377,178	1.372,479	53.613	106,500	87,467
1889	98,373	697,800	992,919	453,446	731,901	2,092.239	65,482	125,500	19.236
1888	170,781	701.150	1,219,493	396.083	234,537	1,422,786	93.874	77.400	99.579
1887	167,412	799,400	1,301,636	372,405	194,403	1,311.618	70,407	51,000	99.762
1886	113.700	471,850	812,95	539,633	180,645	1,789.544	33,732	134,500	73.602
1885	109,786	691,750	1,021.108	545.312	123,007	1,758.943	89.143	48.450	73,612
1884	158,857	700,275	1,176,846	274,112	128,009	1.020.345	103,261	45,100	73.327
1883	206,397	859.700	1,478,891	322,940	97,877	1,066,697	75.158	71,500	95,645
1882	194,639	754,450	1,338.367	330,121	152,181	1,142.544	63 937	77.000	71.313
1881	190,312	807,818	1,378,754	219,644	44,129	702,061	57.678	25,000	48,710
1880	142.424	374,150	801.422	250,465	84,984	836,379	72,571	....	45.427
1879	155,499	496.550	963,047	239,914	31.121	750.863	60,866	....	42.635
1878	108,575	276.950	548,388	154,079	161,159	546,356	66,238	....	39,021
1877	134.003	418.900	753,907	190,842	....	477,105	63,236	....	43.217
1876	117.050	331,800	624,425	167.094	....	417,735	53,269	....	34,148
1875	196.864	444,340	936,500	223,845	....	559,610	46,330	....	32,882
1874	173,281	444,862	878.062	134,963	....	337.408	38.813	....	26,550
1873	117,731	450.955	745,279	153,893	....	384,733	22,556	....	20.395
1872	263,966	490,650	1,150,565	161,419	....	4 3,548	58,073	....	37,694
1871	404,873	349,417	1,361,599	169,746	....	424,365	41,301	....	30,608

No account is taken of potatoes hauled in wagons, which would probably swell the receipts one-half.

GREEN APPLES.

Receipts and Shipments for seven years.

Receipts—barrels.							Shipments—barrels.						
1890.	1889.	1888	1887.	1886.	1885.	1884.	1890.	1889.	1888.	1887.	1886.	1885.	1884
500,460	290,266	213,772	184,238	240,934	255,572	209,298	454,111	318,890	138,868	120,326	191,299	213,063	122,236

Large quantities of apples are brought in by wagons, of which no data can be obtained.

Average rates of freight on Wheat in cents per bushel, by steamer from St. Louis to Liverpool via New Orleans, 1889 and 1890.

Month.	St. Louis to N. O. per bu.		N. O. to Liverpool per bu.		Total St. L. to Liverpool.	
	1890.	1889.	1890.	1889.	1890.	1889.
January	7½	7½	13	12¼	20½	19¾
February	7½	7½	14	12¼	21½	19¾
March	7	6½	12½	13¼	19½	19¾
April	5½	6	11½	13	17	19
May	5½	5½	7	10½	12½	16
June	5½	5½	6	8½	11½	14
July	6	5½	6½	8	12½	13½
August	6½	6	5½	11¾	12	17¾
September	7	6½	4½	12¾	11½	19¼
October	7	6½	4	12¼	11	18¾
November	7	7	2½	12	9½	19
December	7	7½	6	13	13	20½

Average rates of freight on Wheat in cents per bushel, from St. Louis to Liverpool via rail t New York during 1889 and 1890.

Month.	E. St. L. to N. Y. per bu.		N. Y. to Liv. per bu.		Total St. L. to Liv. per bu.	
	1890.	1889.	1890.	1889.	1890.	1889.
January	17.40	17.40	11⅛	9½	28.52½	26 90½
February	17.40	17.40	10¾	9⅜	28.15	26.77
March	17.40	17.40	8	5⅞	25.40	23.27½
April	17.40	17.40	4	4⅞	21.40	22 27½
May	17.40	17.40	4⅛	5⅝	21.52½	23 02½
June	16.08	17.40	3¾	5¾	19.83	23.15
July	15.60	13.80	4¼	6⅞	19.85	20.67½
August	15.60	17.40	2	8¼	17 60	25.65
September	15.60	17.40	1⅜	9⅞	16.97½	27.27½
October	15.60	17.40	⅜	9½	15.97½	26 90
November	15.60	17.40	4½	9¼	20.10	26.65
December	17.40	17.40	5	9⅞	22.40	27 27½

Average rate of freight on Wheat per bushel by steamer from New Orleans to Liverpool during 1889 and 1890.

Month.	Rate in cents.		Month.	Rate in cents.	
	1890.	1889.		1890.	1889.
January	12 to 15	11½ to 13	July	6 to 7	7 to 9
February	14	12 to 12½	August	5½	10 to 13½
March	10 to 15	13 to 13½	September	3 to 6	12 to 13½
April	11 to 12	13 to ...	October	3 to 5	11½ to 13
May	7	9 to 12	November	Nominal to 5	11 to 13
June	6	8 to 9	December	5 to 7	11½ to 14½

Average rate of freight on Wheat per bushel by steamer from New York to Liverpool during 1889 and 1890.

Month.	Rate in cents.		Month.	Rate in cents.	
	1889.	1889.		1890.	1889.
January	11⅛	9½	July	4¼	6⅞
February	10¾	9⅜	August	2	8¼
March	8	5⅞	September	1⅜	9⅛
April	4	4⅞	October	⅜	9½
May	4⅛	5⅝	November	4½	9¼
June	3¾	5¾	December	5	9⅛

Average rates of freight on Grain in cents, from St. Louis to Liverpool via river to New Orleans and via rail to New York.

Year.	To New Orleans by river.		On wheat to New York by rail per 100 pounds.	To Liverpool.	
	On grain in sacks per 100 lbs.	On wheat in bulk per bushel.		Via New Orleans, on wheat per bushel.	Via New York, on wheat per bushel.
1877	21	8½	41	....	....
1878	17½	7¼	38	....	....
1879	18	7¾	33½	....	....
1880	19	8¼	42	....	....
1881	20	6	32	....	....
1882	20	6 5-12	29½	22 2-3	23⅜
1883	17¾	5½	33	19 7-12	27
1884	14	6 5-8	26	14 7-12	21¼
1885	15	6 2-5	22 1-7	15 1-9	20½
1886	16	6½	29	16 1-6	24
1887	18¼	6	32 2-15	15	24⅛
1888	15	6½	*29½	15 1·6	22.95
1889	17.93	5.95	28½	17 1-3	24.97
1890	15.66	6.58	27⅝	14 1-3	21.48

*These figures represent published rates. At times during the year the rate was as low as 20c per 100 lbs., making the average rate St. Louis to Liverpool via New York at times as low as say 17½c per bushel on wheat.

All rai' published rates of freight from East St. Louis to New York City during 1890.

WHEAT.	From January 1 to June 9	29	cts. per 100 lbs.
	June 9 to November 24	26	" "
	November 24 to December 31	29	" "
CORN...	From January 1 to May 15	23½	cts. per 100 lbs.
	May 15 to November 24	23	" "
	November 24 to December 31	26	" "
OATS...	From January 1 to May 15	25½	cts. per 100 lbs.
	May 15 to November 24	23	" "
	November 24 to December 31	29	" "
FLOUR..	From January 1 to November 24	52	cts. per barrel.
	November 24 to December 31	58	" "

To Boston........5 cents higher than New York rate.

To Philadelphia..2 cents lower than New York rate.

To Baltimore.....3 cents lower than New York rate.

Rate on grain from St. Louis elevators 1½ cents per 100 pounds more than East St. Louis rate.

Rate on other heavy freight from St. Louis 4 cents per 100 pounds more than East St. Louis rate, and on higher classes of freight 5 cents per 100 pounds.

From Union depot one-half these rates.

All rail rates of freight in cents from St. Louis to Southern cities during 1890.

Articles.	Memphis.	Vicksburg.		New Orleans.	
	Jan. 1 to Dec. 1, 1890.....	Jan. 1 to Feb. 25, 1890....	Feb. 25 to Dec. 31, '90..	Jan. 1 to Feb. 25, 1890....	Feb. 25 to Dec. 31, '90..
Flour per barrel	30	45	45	45	45
Pork per barrel	50	75	75	75	75
Grain per 100 pounds	12	20	20	20	20
Meat, packed, per 100 pounds	16	28	25	28	25
Meat, loose, per 100 pounds	16	28	28	28	28
Hay, per 100 pounds	12	20	20	20	20

Published average rate of freight by rail on grain from East St. Louis to New York.

	Per 100 lbs.		Per 100 lbs.
1890 On wheat	27⅝ cts.	1883	29½ cts.
1890 On corn	23½	1882	33
1889	28½	1881	32
1889	26	1880	42
1888	29½	1879	33½
1887	32 2/15	1878	38
1886	29	1877	41
1885	22 1/7	1876	39½
1884	26		

Weekly prices of St. Louis Winter Wheat Flour for 1890.

1890.		XXX.	Family.	Choice.	Fancy.	Extra fancy	Patents.
Jan.	4..	2 20 @2 30	2 40 @2 50	2 70 @2 80	3 20 @3 30	3 65 @3 75	4 05 @4 20
	11..	2 20 2 30	2 40 2 50	2 70 2 80	3 20 3 30	3 60 3 70	4 00 4 20
	18..	2 20 2 30	2 40 2 50	2 70 2 90	3 20 3 30	3 60 3 70	4 00 4 15
	25..	2 20 2 30	2 40 2 50	2 70 2 80	3 20 3 30	3 60 3 70	4 00 4 15
Feb.	1..	2 20 2 30	2 40 2 50	2 70 2 80	3 20 3 30	3 60 3 70	4 00 4 15
	8..	2 20 2 30	2 40 2 50	2 70 2 80	3 20 3 30	3 60 3 70	4 05 4 15
	15..	2 20 2 30	2 40 2 50	2 70 2 80	3 20 3 30	3 60 3 70	4 05 4 20
	21..	2 20 2 30	2 40 2 50	2 70 2 80	3 20 3 30	3 60 3 70	4 05 4 15
Mar.	1..	2 20 2 30	2 40 2 50	2 70 2 80	3 20 3 30	3 60 3 70	4 00 4 15
	8..	2 25 2 35	2 40 2 50	2 70 2 80	3 20 3 30	3 65 3 75	4 05 4 15
	15..	2 25 2 35	2 40 2 50	2 65 2 80	3 20 3 35	3 65 3 80	4 05 4 15
	22..	2 20 2 30	2 40 2 50	2 70 2 80	3 30 3 40	3 70 3 80	4 05 4 20
	29..	2 20 2 30	2 40 2 50	2 70 2 80	3 30 3 40	3 70 3 80	4 05 4 20
April	5..	2 20 2 30	2 40 2 50	2 75 2 85	3 35 3 45	3 75 3 90	4 10 4 25
	12..	2 40 2 50	2 60 2 70	2 90 3 00	3 60 3 70	4 10 4 20	4 40 4 50
	19..	2 40 2 50	2 65 2 75	2 90 3 10	3 60 3 70	4 10 4 20	4 50 4 60
	26..	2 40 2 50	2 65 2 75	2 90 3 10	3 60 3 70	4 10 4 20	4 50 4 60
May	3..	2 40 2 50	2 65 2 75	2 90 3 10	3 65 3 80	4 20 4 30	4 55 4 65
	10..	2 40 2 50	2 70 2 80	3 00 3 30	3 90 4 10	4 40 4 50	4 80 5 00
	17..	2 40 2 50	2 70 2 80	3 00 3 30	3 85 4 00	4 40 4 50	4 80 4 90
	24..	2 50 2 60	2 80 3 00	3 15 3 40	4 10 4 25	4 60 4 70	5 00 5 10
	31..	2 50 2 60	2 75 2 85	3 15 3 40	4 00 4 10	4 45 4 55	4 85 5 00
June	7..	2 50 2 60	2 75 2 85	3 10 3 30	3 90 4 10	4 40 4 50	4 80 4 95
	14..	2 50 2 60	2 70 2 80	3 00 3 15	3 80 3 90	4 30 4 40	4 70 4 85
	21..	2 50 2 60	2 70 2 80	3 00 3 15	3 75 3 90	4 25 4 35	4 65 4 80
	28..	2 15 2 30	2 40 2 55	2 75 3 00	3 50 3 70	4 10 4 25	4 55 4 70
July	5..	2 15 2 30	2 40 2 55	2 75 3 00	3 50 3 70	4 15 4 25	4 45 4 70
	12..	2 15 2 30	2 40 2 55	2 75 3 00	3 55 3 70	4 25 4 40	4 70 4 85
	19..	2 15 2 30	2 40 2 55	2 75 3 00	3 55 3 70	4 25 4 35	4 65 4 80
	26..	2 50 2 55	2 70 2 80	3 00 3 10	3 70 3 80	4 35 4 45	4 75 4 85
Aug.	2..	2 50 2 55	2 70 2 80	3 00 3 10	3 70 3 80	4 30 4 40	4 75 4 85
	9..	2 55 2 60	2 75 2 85	3 10 3 30	3 80 4 00	4 40 4 55	4 80 4 95
	16..	2 65 2 75	2 00 3 10	3 25 3 40	4 00 4 20	4 55 4 70	4 95 5 10
	23..	2 75 2 80	3 10 3 20	3 30 3 60	4 30 4 50	4 80 4 90	5 10 5 25
	30..	2 75 2 85	3 15 3 25	3 40 3 60	4 40 4 50	4 70 4 80	5 00 5 20
Sept.	6..	2 90 3 10	3 25 3 30	3 50 3 75	4 35 4 50	4 70 4 80	5 00 5 15
	13..	3 00 3 10	3 25 3 35	3 50 3 75	4 30 4 40	4 70 4 85	5 05 5 20
	20..	3 00 3 10	3 25 3 35	3 50 3 75	4 30 4 40	4 65 4 80	5 00 5 15
	27..	3 00 3 10	3 25 3 35	3 50 3 75	4 30 4 40	4 65 4 75	5 00 5 10
Oct.	4..	3 00 3 10	3 25 3 35	3 50 3 75	4 25 4 35	4 60 4 75	5 00 5 10
	11..	3 00 3 10	3 25 3 35	3 50 3 75	4 25 4 35	4 60 4 75	5 00 5 10
	18..	3 00 3 10	3 25 3 35	3 50 3 75	4 20 4 30	4 55 4 70	4 95 5 10
	25..	3 00 3 10	3 25 3 35	3 50 3 75	4 20 4 30	4 55 4 65	4 90 5 00
Nov.	1..	3 00 3 10	3 25 3 35	3 50 3 75	4 20 4 30	4 50 4 65	4 90 5 00
	8..	3 00 3 10	3 20 3 35	3 50 3 70	4 10 4 25	4 45 4 55	4 80 5 00
	15..	2 90 3 00	3 15 3 25	3 40 3 60	4 00 4 10	4 30 4 40	4 70 4 80
	22..	2 90 3 00	3 10 3 20	3 50 3 60	4 10 4 20	4 30 4 40	4 75 4 85
	29..	2 90 3 00	3 10 3 25	3 50 3 70	4 10 4 20	4 35 4 45	4 70 4 90
Dec.	6..	2 90 3 00	3 10 3 25	3 50 3 70	4 10 4 20	4 30 4 40	4 70 4 85
	13..	2 90 3 00	3 10 3 25	3 40 3 65	4 00 4 15	4 35 4 45	4 65 4 80
	20..	2 90 3 00	3 10 3 25	3 40 3 65	4 00 4 15	4 40 4 50	4 70 4 85
	27..	2 90 3 00	3 10 3 25	3 40 3 65	4 00 4 10	4 25 4 40	4 65 4 80

Receipts of Wheat by crop years.

	Bushels.		Bushels.
Year ending June 30, 1885....	17,547,567	Year ending June 30, 1888....	13,416 972
" " " 1886....	8,400,191	" " " 1889....	12,960,809
" " " 1887....	13,221,688	" " " 1890....	15,205,124

Weekly comparative prices of Wheat for two years.

	No. 2 Red.		No. 3 Red.	
	1890.	1889.	1890.	1889.
Jan. 3	77⅞ @	95⅛ @	73½ @	93 @ 93½
" 10	77⅞	95¾	75	93⅛
" 17	77¾	94 94½	74½ 75	92½
" 24	77¼	90⅞ 91	74	89½ 90
" 31	75½ 76	90 90½	72¾	89
Feb. 7	75⅝ 75¾	93½	73½	92
" 14	75⅛ 75¼	96	73½	93½
" 21	76⅛	97⅝ 97¾	72½ 72¾	93⅝ 94¾
" 28	76 76½	96⅛ 96½	73 73¼	94½
Mar. 7	76⅜ 76½	94¼ 95	74	92 92¾
" 14	76⅞ 77¼	92½ 92⅝	73¾	90½ 91
" 21	78¼ 78¾	92 93½	75⅝ 75¾	91
" 28	77¾ 78	92¾ 93	75	90½ 91¼
April 5	80 80⅜	91 91⅜	77 77¼	87½
" 11	83 84	86½ 87	79	82½
" 18	86	82¼ 83	79½	79 80
" 25	86 86¼	79⅝ 80	83	75½
May 2	89½ 89⅝	76¾ 77	83	73 74
" 9	93 95	78¼ 79	89	75½
" 16	94 94½	79 79½	....	76¼
" 23	98⅜ 100	77¼ 78	....	75
" 30	95 97	76¾ 77¼	....	75
June 6	93¼ 93½	80 80¼	....	76½
" 13	89 90	94½ 95	85½	86
" 20	87½ 88	80	84	76½
" 27	83⅝	85 88	81	80½
July 4	86⅜ 86½	77	....	74
" 11	89⅜ 89½	72⅝ 73½	85½	68¾ 69
" 18	87 87⅛	74¼ 75¼	82¾	70¼ 71¼
" 25	90½ 91	75¾ 76⅜	84¾ 85¼	72⅝ 73½
Aug. 1	87¾ 88¼	73½ 74	83 83½	71 71¼
" 8	93¼ 93½	73½ 73¾	88¾ 89¼	70 70¾
" 15	95¾ 96¼	74⅛ 75	92 92½	72 72¾
" 22	98⅜ 99⅝	74⅜ 74⅝	96½ 97	71⅛ 71½
" 29	98 99	76 76⅛	96 96½	72¼ 72½
Sept. 5	97¾ 99¼	76	95 95¼	71¾ 72
" 12	100 100¾	77¼ 77⅞	97	73 73¼
" 19	99⅝ 100	78½	97¼ 98	74½ 76½
" 26	97 97⅝	81½	94 94½	76½ 78
Oct. 3	98 99	77¾ 78	95 95½	75 75½
" 10	99¼ 99⅞	78¼ 78½	96¼	75 75¼
" 17	99¼ 100½	78	96	74¼ 74½
" 24	97¾ 99¼	76 76⅛	94 96	72⅞ 73¼
" 31	98⅛ 98⅜	76⅞ 77⅝	95½ 95¾	74 74¼
Nov. 7	96 97¼	77¾ 78	93¾ 94	75⅛ 75¼
" 14	91⅜ 91⅝	78⅞ 79	88¾ 90	76
" 21	89 90	78⅛ 78¼	95½ 68½	75 75¼
" 28	91¼ 91½	78⅝ 78⅞	88½	74⅜
Dec. 5	92¾ 93	78¼ 78⅜	90	74
" 12	94 95	77¼ 77⅜	93	72⅝ 73
" 19	95¼ 96¼	77¾	93½	73¼
" 26	93¼ 94½	77½	91	72¾ 73

Earliest new-crop receipts in St. Louis in 1890: Wheat—First receipt in 1890 was on June 20; couple small lots from line of Kentucky and Tennessee—small grain, thin and tough red, about No. 4—which sold at $1 05; next day a Missouri lot sold—bulk car, equaling No. 2 red—which sold at 95⅛c; first receipt in 1889 was on June 25, from Kansas.

Weekly comparative prices of Corn, Oats, Rye and Barley for two years.

Weeks.	Corn. No. 2 mixed.		Oats, No. 2.		Rye. No. 2 or prime.		Barley. Prime to f'cy.	
	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.
January 3....	25¼ @25⅜	30 @30⅛	19¾ @20	24½ @	42 @42½	48 @49	45 @59	60 @85
10....	25¼ 25½	29⅝ 29¾	20¼	25	41½	47¾	45 59	60 85
17....	25⅞ 26	29⅞ 30	21¼	24¾	41	47 48	45 60	60 80
24....	26¼ 26⅜	30	20¼	25¼	41½ 41¾	47½	45 58	60 75
31....	26½ 26⅞	29⅛ 29⅝	20	25 25½	41½	47 47¼	45 58	55 75
Febr'y 7....	26¼	29¼	21	25	42¼	46	45 58	55 72
14.. .	25	28	20⅛	24	41½	45 45½	43 57	55 72
21....	24¾ 24⅞	27½ 27⅝	20½	25	40½	45	43 55	55 70
28....	25 25⅛	28⅜ 28½	20½	24½	40¾ 41⅛	45	43 55	55 71
March 7....	25	28⅝	20½	25½	40 40½	43	38 53	50 71
14....	25 25⅛	29¼	20½	25	40½ 41	41	38 53	50 71
21....	25¾	29½	23 23½	25	40¼ 40¾	41¾	38 53	50 68
28....	25⅝ 25½	29¾	22	25½	41	43 44	38 53	50 71
April 4....	27⅜ 27½	30¼	22¼ 22½	25¾	42 42¼	44 45	40 55	50 70
11 ...	29¼ 29½	30¼	23 23½	24	41½ 42	42 42½	50 65	50 70
18....	29¾ 30	30 30¼	25½ 26	23	44½	43 44	45 55	50 70
25....	30½ 30¾	30⅜ 30⅝	26½ 26¾	24½	50	42¾	45 55	45 70
May 2....	31¾ 32¼	30¼ 30½	27	23½ 24	55	41 42½	45 55	45 70
9....	35½ 36¼	32½	29	23½	50	40 41	45 55	45 70
16....	34½ 35¼	31¾ 32	30	23¼ 23½	52	41	45 55	....
23....	32 32¼	31½ 31¾	27½	24¾	55	40½ 41	48	....
30....	31½ 31⅝	31¼ 31¾	28 30	23	52½	40	......	....
June 6 ...	32⅜ 32½	31⅛ 31¼	28½	23	52	39	......	....
13....	32¼ 32½	31¼	28¾	23	47½ 48	39	......	....
20....	32⅜ 32⅝	31 31⅛	28⅜ 28¾	23	46 47	39	......	....
27....	33 33⅛	31½	28	22½	45	40	......	....
July 4....	33¾ 34	31¾ 32	29	23	46	38	.....	....
11....	36 36¼	33½ 33¾	32½	24	52	40	......	....
18....	36½	33	33	23	50	42	......	....
25....	37½ 37⅞	33⅜ 33½	35 36	24	50	42	......	....
August 1....	43⅜ 43¾	33½ 33⅝	33¾ 34	21⅝	51	39	......	....
8....	47½ 47¾	33½	39¼	20	60	38½	......	....
15....	45 45¼	33	38	19 19¼	66	38	......	....
22....	44⅞ 45¼	32 32⅛	36⅞ 37	18¾	69	38½ 39	.....	....
29....	44 45	29⅞ 30⅛	33¼ 33½	18⅛ 18¼	68 68½	38	65 70	....
Sept. 5....	44½ 45	29⅞	32¾ 33½	18½	66	38¾	65 73	60 70
12....	46½ 47	29¾ 30	36⅛ 36½	18¼	61	38¼	65 77	60 69
19....	45½ 46	20¾ 29⅞	36 36½	18¼ 18½	59 59½	37½ 38¼	68 77	54 69
26....	47 47¼	29¾	37½ 37⅝	17⅝	59 60	38½	67 75	58 70
October 3....	48½ 48¾	29¼	37¼	18	60	40	65 75	55 67
10....	49½	28¼	38	18	60¼	39	65 72	55 66
17....	48 48¼	28½ 28⅝	39 39½	18 18⅛	61½	38¾	64 74	55 66¼
24....	49¼ 49½	28⅛ 28¼	42	17⅜ 17½	64	38 38½	65 75	50 66¼
31....	51 51¾	29⅜ 29½	44½ 45	18	65	38¼	70 80	50 64½
Nov. 7....	52¾ 53	30¼	44½	18¼	71½ 72½	39	73 80	50 62½
14....	49½ 50	30 30⅛	46	19⅛	72	40½	74 79	50 65
21....	52	32½	45	19½	68 70	40	71 80	50 62½
28....	53 54	29 28⅝	44¾	21	72	40 40½	72 79	50 64
Dec. 5....	50¼ 51	27¾	45½	20	68½ 69	40 41	71 78	50 62½
12....	51½ 52¼	27½ 27⅝	44⅛	20	68	44 45	68 76	45 58
19....	48½ 48⅝	26⅝ 26⅞	42 42⅛	19¾	67½ 68	43 43½	68 77	45 59
26....	46¼ 46½	25¼	41	19½	66	45	68 72	45 58

Canada Barley (this side) sold in January at 74c to 77c for No. 1; and 68c to 72c for No. 2. In February at 74c to 75c for No. 1; and 68c to 69c for No. 2.

EARLIEST NEW-CROP GRAIN RECEIPTS IN 1890.

CORN—First receipt in 1890 was on October 25th from Illinois—car nice and seasonably dry yellow, which sold at 49c. First arrival in 1889 was on October 12th from Kansas—a car no grade.

OATS—First receipt in 1890 was on July 8th from Kansas—graded No. 3, and sold at 30½c. First arrival in 1889 was on July 19th, also No. 3 from Kansas.

BARLEY—First arrival in 1890 was on August 19th—car choice No. 3, from Nebraska. First arrival in 1889 was on July 16 (Missouri fall); some spring from Kansas on 27.

SEEDS.

Receipts for four years.

Seeds.	1890.			1889.			1888.			1887.		
	S'ks.	Bush.	Tons	S'ks.	Bush.	Tons	S'ks.	Bush	Tons	S'ks.	Bush.	Tons.
Flax........	6748	1307500	.....	7238	849000	....	4243	566000	.....	8200	405500	......
Other.....	56278	....	.....	55623	......	...	68396	......	.....	56830	......	.....
Cotton.....	.....	......	6908	.....	.....	5510	.....	......	8807	......	......	10982

FLAX-SEED.

	Sacks.	Bushels.
Shipment for 1881	57,578	324,769
" " 1882	35,031	578,132
" " 1883	21,660	293.937
" " 1884	10.543	117,655
" " 1885	8.608	83.407
" " 1886	3.165	50,163
" " 1887	4,035	83,758
" " 1888	6,154	45,975
" " 1889	2,625	340,288
" " 1890	518	700,160

Monthly range in price of Prime for three years ("sowing" not included).

	1890.	1889.	1888.
January	1 25 @1 30	1 50 @....	1 38 @1 35
February	1 25 1 35	1 50 1 45	1 37½ 1 40
March	1 40	1 45	1 40 ....
April	1 40 1 45	1 45	1 40 ....
May	1 45 1 40	1 45	1 40 1 12
June*	1 40 1 35	1 30 1 15	1 10 1 15
July†	1 25 1 31	1 20 1 30	1 02½ 1 05
August	1 28 1 37	1 29 1 18	1 07 @27 @1 15 @17
September	1 37 1 52	1 20 1 27½	1 17 @1 26
October	1 50 1 37½	1 29 1 24	1 26 1 40
November	1 35 1 18	1 23 1 26	1 38 1 45
December	1 22 1 14	1 27 1 30	1 42 @1 45 @1 48

*August delivery sold at $1.30; September at $1.29@1.30.

†July sold at $1.29 to $1.25; August, $1.30@1.25; September at $1.31 to $1.26.

SHIPMENTS OF FARM PRODUCTS

FROM MISSOURI RAILROAD POINTS DURING 1890.

In response to a request from the office of the Board of Agriculture, the following statements of shipments of farm products have been received from the various railroad companies operating in the State:

KANSAS CITY, FORT SCOTT & MEMPHIS RAILROAD.

KANSAS CITY, February 23, 1891.

Secretary Missouri State Board of Agriculture, Columbia, Mo.:

DEAR SIR—As requested in yours of the 6th inst., I enclose herewith statements showing shipment of agricultural products from stations on our lines, in Missouri, during the calendar year 1890. Yours truly,

GEO. H. NETTLETON.
President and Gen'l Manager.

Number of car loads of live stock and farm products shipped.

Stations.	Cotton Bales...	Wheat...	Corn ...	Oats...	Hay....	Flour & millstuffs	Cattle...	Hogs...	Horses, mules & sheep...	Flax....	Potatoes.	Total....
Kansas City	....	619	8478	4212	131	4482	674	552	289	9	458	19,904
Hume	....	....	73	9	1	..	147	94	3	23	....	352
Sprague	....	....	14	2	4	....	77	27	1	25	....	150
Rich Hill	....	....	3	2	9	1	12	2	2	....	....	31
Carbon Centre	....	....	....	....	4	...	23	6	.....	....	....	33
Joplin	....	....	....	....	....	18	30	42	8	....	....	98
Minden	....	....	....	1	139	....	25	15	.....	....	..	180
Last Chance	....	....	....	...	56	....	...	...	...	....	....	56
Liberal	....	....	18	5	208	1	100	31	1	....	....	364
Iantha	....	....	34	11	279	19	101	66	.....	3	....	513
Lamar	....	....	2	4	205	17	97	59	28	30	4	446
Kenoma	....	3	3	6	281	2	27	21	.....	....	2	345
Golden City	....	....	....	19	192	7	196	188	26	116	....	744
Lockwood	....	2	1	35	154	6	164	122	.....	103	....	587
South Greenfield	....	68	....	1	....	37	60	100	4	2	....	272
Pilgrim	....	1	....	....	....	....	....	....	.....	....	....	1
Everton	....	38	1	....	....	96	30	79	.....	19	....	263
Ash Grove	....	14	5	2	....	88	25	51	3	....	1	189
Bois D'Arc	....	27	6	....	4	....	14	42	.....	....	....	93
Nichols	...	187	400	56	179	314	40	42	47	....	....	1,265
Springfield	5	52	8	1	6	335	74	33	92	....	...	601
Rogerville	...	20	1	....	....	....	4	1	.....	....	...	26
Fordland	....	1	....	....	....	....	18	8	4	....	...	31
Seymour	....	4	1	3	10	6	68	15	17	....	....	124
Cedar Gap	....	....	....	....	....	...	10	11	2	....	1	24
Mansfield	38	....	....	....	....	2	39	22	12	....	....	85
Norwood	66	7	....	....	....	....	11	13	3	....	....	34
Mountain Grove	2	12	....	....	2	10	39	37	19	....	2	121
Cabool	....	....	....	....	....	1	39	7	3	....	....	50
Willow Springs	....	....	....	....	....	....	16	2	1	...	...	19
Olden	....	....	....	....	....	....	2	....	1	....	1	4
West Plains	836	2	....	....	13	7	169	33	32	....	....	256
Brandsville	....	....	....	....	5	....	...	....	.....	....	....	5
Thayer	496	....	....	....	....	....	16	4	3	....	....	23
Total	1443	1057	9048	4369	1882	5149	2357	1727	601	330	469	27,289

G. N. WILSON, Freight Accountant.

Kansas City, Mo., February 19, 1891.

KANSAS CITY, CLINTON & SPRINGFIELD RAILWAY.

Number of car-loads of farm products and live stock shipped from points on the Kansas City, Clinton & Springfield railway in Missouri during the year 1890.

Stations.	Wheat...	Corn....	Oats....	Flax and other s'd	Flour...	Hay....	Cattle and horses..	Hogs and sheep..	Total...
Belton	52	7	14	5	....	70	121	51	320
Raymore	27	55	25	16	....	32	20	45	220
Pleasant Hill	3	....	1	....	....	3	....	....	7
Coleman	9	80	12	11	....	34	25	36	207
Harrisonville	5	30	2	18	....	8	54	59	176
Daugherty	5	28	14	4	....	39	25	48	163
Garden City	35	33	25	26	...	6	117	139	381
Creighton	12	113	25	3	....	1	49	97	300
Urich	23	190	125	8	....	6	84	132	568
Hartwell	2	18	1	....	....	....	12	14	47
Clinton	5	360	121	7	119	277	38	42	969
Deepwater	....	34	3	....	....	4	34	25	100
Lowry City	3	99	51	9	....	168	30	42	402
Osceola	2	1	....	....	2	2	16	32	55
Vista	....	....	....	....	....	1	5	4	10
Collins	4	16	12	3	...	...	39	95	169
Humansville	....	24	16	1	....	8	53	105	207
Dunnegan Springs	....	....	....	....	....	....	1	3	4
Fair Play	20	....	....	....	....	2	61	172	255
Aldrich	1	1	....	....	10	....	14	47	73
Sharon	1	...	....	....	1	....	2	3	7
Walnut Grove	23	....	....	....	2	....	26	50	101
Phenix	....	....	....	....	....	....	....	2	2
Ash Grove	....	..	....	....	....	....	5	....	5
Totals	232	1089	447	111	134	661	831	1243	4748

G. N. Wilson, Freight Accountant.

Kansas City, Mo., February 19, 1891.

THE MISSOURI PACIFIC RAILWAY.

St. Louis, Mo., February 24, 1891.

Mr. Levi Chubbuck,
Secretary Missouri State Board of Agriculture, Columbia, Mo.:

Dear Sir—Complying with your favor of the 6th instant, I have pleasure in transmitting the enclosed statement showing classified weight in pounds of various products from points on the Missouri Pacific and St. Louis, Iron Mountain & Southern railways of Missouri.

Trust same may be of service to you in compilation of your forthcoming report.

Yours truly,
C. G. Warner,
General Auditor.

Classified weight in pounds of Freight forwarded from Points on Missouri Pacific and St. Louis, Iron Mountain & Southern Railways in Missouri during year 1890.

Classes.	Mo. Pac. Ry.	St.L.,I.M.&S	Both lines.
Products of the forest:			
Lumber	50,610,436	375,901,024	426,511,460
Other articles	157,104,620	129,143,255	286,247,875
Products of animals:			
Live stock	207,649,827	20,605,500	228,255,327
Other articles	2,920,170	500,448	3,420,618
Products of agriculture:			
Flour and sacked grain	160,983,369	72,268,009	233,251,378
Bulk grain	192,649,838	17,125,571	209,775,409
Cotton	....	1,667,557	1,667,557
Other articles	67,638,024	88,156,523	155,794,547
Manufactures and merchandise	86,603,683	140,068,966	226,672,649
Miscellaneous products:			
Coal	1,153,705,066	69,188,820	1,222,893,886
Iron ore	505,920	253,867,530	254,373,450
Pig iron	279,950	256,420	536,370
Other articles	712,167,256	269,283,978	981,451,234
Total	2,792,818,159	1,438,033,601	4,230,851,760

THE WABASH RAILROAD.

St. Louis, Mo., March 5, 1891.

Levi Chubbuck, Esq.,
Secretary Missouri State Board of Agriculture, Columbia, Mo.:

Dear Sir—In accordance with your request of February 6th, addressed to Mr. C. M. Hays, General Manager, I enclose a statement of the number of pounds of different classes of farm products, etc., shipped from points on our lines in Missouri during the year 1890.

Yours truly,
D. B. Howard,
Auditor.

Products of Agriculture and Live Stock forwarded from Points in Missouri for the year 1890.

Wheat.	Corn.	Other grain.	Flour.	Other mill products.	Hay.	Tobacco.	Fruits and vegetabls.	Livestock.
Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds	Pounds.	Pounds.	Pounds.
75,928,345	29,029,596	45,229,364	34,949,006	4,682,995	20,928,866	6,229,628	25,761,773	164,196,953

THE CHICAGO & ALTON RAILROAD.

CHICAGO, February 12, 1891.

L. CHUBBUCK, ESQ., Secretary Missouri State Board of Agriculture, Columbia, Mo.:

DEAR SIR—As requested in your letter of 6th inst., I take pleasure in informing you that there was shipped at local stations on our road in Missouri during the year 1890:

	Cars.		Cars.
Wheat	1,350	Cattle	3,144
Corn	314	Hogs	2,191
Oats	281	Sheep	283
Barley	1	Horses	337
Seeds	2		

The above figures are exclusive of the freight of this description handed to us by other roads at junction points.

Yours truly,

C. KELSEY, Auditor.

MISSOURI, KANSAS & TEXAS RAILWAY.

SEDALIA, February 25, 1891.

LEVI CHUBBUCK, ESQ., Sec'y Missouri State Board of Agriculture, Columbia, Mo.:

DEAR SIR—In compliance with your favor of February 6th, I have the honor of transmitting to you the enclosed statement, showing number of tons of live stock, grain and other agricultural products moved on our line in Missouri for the year 1890, also showing same reduced to number of cars.

Yours truly, GEO. J. POLLOCK, Auditor.

Live Stock and other Farm Products shipped from points on line of the M., K. T. Ry., in Missouri, during the year 1890.

	Tons.	Cars.
Live stock	50,142	5,014
Flour and sacked grain	42,229	2,816
Bulk grain	31,957	2,130
Other agricultural products	25,480	1,699

ST. LOUIS & HANNIBAL RAILWAY.

HANNIBAL, Mo., March 17, 1891.

LEVI CHUBBUCK,
Secretary State Board of Agriculture, Columbia, Mo.:

DEAR SIR—Your favor of February 6, to Mr. Geo. B. Clason, General Manager, was referred to me for reply. I have gathered the information you desire and submit herewith the following statement of farm products shipped from points on this line during the year 1890:

	Cars.		Cars.
Horses	23	Wheat	541
Mules	28	Oats	61
Cattle	294	Corn	2
Hogs	558	Hay	5
Sheep	81	Seed	7
Mixed	88	Fruit	3

Trusting that this will prove satisfactory, I am

Yours truly,
W. W. DRIGGS,
Gen'l Frt. and Tkt. Agt.

HANNIBAL & ST. JOSEPH AND K. C., ST. JOE & C. B. RAILROAD.

ST. JOSEPH, Mo., March 2, 1891.

Mr. LEVI CHUBBUCK, Secretary Mo. State Board of Agriculture, Columbia, Mo:

DEAR SIR—Herewith as per your letter February 21, I hand you statement showing the car-loads of different kinds of grain, live stock, and other farm products over our roads for the year 1890.

Shipments of grain and live stock from stations on the Kansas City, St. Joseph & Council Bluffs Railroad were 4118 cars, of which there were:

	Cars.		Cars.
Wheat	487	Cattle	3,530
Corn	3,490	Hogs	2,933
Oats	98	Sheep	69
Timothy seed	1	Horses and mules	71
Rye	34	Mixed stock	13
Barley	5	Live poultry	12
Flax seed	1		
Miscellaneous grain	2		

Shipments of fruit and other farm products from stations on the Kansas City, St. Joseph & Council Bluffs Railroad were 1,345 cars, making a total of 12.091 cars.

Shipments of grain from stations on the Hannibal & St. Joseph Railroad were 744 cars, and live stock 5,340 cars.

	Cars.		Cars.
Wheat	361	Cattle	2,130
Corn	86	Hogs	2,473
Oats	291	Horses and mules	255
Rye	2	Sheep	143
Timothy seed	1	Live poultry	39
Seed	3		

Shipments of fruit and other farm products from stations on the Hannibal & St. Joseph Railroad were 401 cars, making a total of 6,485 cars.

Total K. C., St. J. & C. B. Ry	12,091 cars.
Total H. & St. J. Ry	6,485 "
Grand total	18,576 cars.

This does not include any shipments from Missouri river points proper or that originate west thereof.

Yours truly,

J. S. BARTLE.
General Freight Agent.

ATCHISON, TOPEKA & SANTA FE RAILROAD.

CHICAGO, March 31, 1891.

Mr. LEVI CHUBBUCK,
Secretary Missouri State Board of Agriculture, Columbia, Mo.:

DEAR SIR—On February 6 you wrote to Mr. A. A. Robinson, Second Vice-President and General Manager of this company, requesting certain statistics, and he referred the matter to us, and in compliance with your request beg to state that during the year ending December 31, 1890, there were shipped from our stations in Missouri:

	Cars.		Cars.
Wheat	1,232	Cattle	5,564
Corn	4,507	Hogs	1,582
Other grain, seed, etc	378	Sheep	464
		Horses	162
Total	6,117	Total	7,772

Trusting this information may prove favorable to you, we remain,

Yours truly,

J. G. MILLER, A. G. F. A.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

CHICAGO, February 19, 1891.

Mr. LEVI CHUBBUCK,
Secretary State Board of Agriculture, Columbia, Mo.:

DEAR SIR—Referring to your favor of the 6th inst. addressed to Mr. A. J. Earling, General Manager, which was referred to me, I have pleasure in handing you herewith a statement, which I trust will be suitable to your needs.

Yours truly,
J. H. HILAND,
General Freight Agent.

Farm products way-billed from C. M. & St. P. stations in Missouri during the year 1890.

Commodity.	Tons.	Commodity.	Tons.
Wheat	17,589	Butter and cheese	110
Rye	932	Other farm products	3,875
Barley	262	Horses	1,493
Oats	5,015	Cattle	103,783
Corn	27,277	Hogs	20.911
Potatoes	832	Sheep	2,174
Beans	58		
Seeds	152	Total	185,443
Hay	980		

CHICAGO, ROCK ISLAND AND PACIFIC RAILWAY.

CHICAGO, March 4, 1891.

Mr. LEVI CHUBBUCK,
Secretary Missouri State Board of Agriculture, Columbia, Mo.:

DEAR SIR—I enclose you herewith statement requested in your recent favor, and trust it will meet your requirements.

Very truly,
E. ST. JOHN,
General Manager.

Car loads of live stock and farm produce shipped from points on the C., R. I & P. railway in Missouri for year 1890.

Commodities.	Number pounds.	Number cars.
Wheat	41,129,942	1,371
Corn	171.674,653	5,722
Rye	2,987.932	100
Oats	54.668,564	1,822
Barley	3,004,937	100
Potatoes	4,126,339	138
Grass and flax-seed	3,261,195	109
Broom corn	118.069	10
Fruit	22,195,809	1,110
Cattle	75,278.965	3,764
Hogs	50,789,465	3,174
Sheep	2,448,396	204
Horses	7,878,626	415
Hay	2,304,008	115
Totals	441,866,900	18,154

TABULATED ASSESSMENT OF ALL RAILROAD LINES IN MISSOURI.

State Auditor J. M. Seibert, who is a member of the Board of Equalization, and ex officio Secretary, tabulated the assessment of the railroad bridges and telegraph property of the State, and laid the same before the Board. The values fixed by the Board last year and this year are as follows:

Items.	1891.	1890.
Road-beds	$48,596,187 00	$46,124,398 25
Rolling-stock	9,257,501 34	8,928,458 39
Buildings on right of way	1,295,785 00	1,221,055 00
Bridges	2,964,000 00	2,250,000 00
Telegraph lines	840,975 60	799,047 80
Totals	$62,164,448 94	$60,322,959 44

This shows an increase over the 1890 assessment of $1,842,046.60. The number of miles of railroad in operation in the State on June 1, 1890, subject to taxation for 1891, was 5,901.632, which shows an average assessed value of $10,380.0903 per mile, including rolling-stock, buildings on right of way and bridges, which is all used wholly in the operation of the railroads and considered as railroad property for the purposes of taxation. The tabulated statement is as follows:

Name of road.	Value per mile.	Aggregate value in State.
Cape Girardeau Southwestern	$3,459	$336,885
Brownwood branch	2,459	21,604
Cherry Valley	4,454	26,825
Chicago, Rock Island & Pacific	12,310	1,060,896
Atchison branch	7,310	216,025
Leavenworth branch	9,310	489.462
St. Joseph branch	9,810	647,723
Topeka branch	16,310	29,367
Kansas City, St. Louis & Chicago (Chicago & Alton)	17,341	2,836,268
Louisiana & Missouri River (Chicago & Alton)	17,167	890,747
Same, South Division (Chicago & Alton)	4,385	220 936
Atchison & Nebraska	42,474	131,247
St. Joe & Nebraska	9,474	58,622
Brownville & Nodaway Valley	4,342	44,395
Chicago, Burlington & Kansas City	4,880	511,428
Hannibal & St. Joe	16,195	3,404.434
Cameron & Kansas City branch	16,204	910,886
Atchison branch	10,638	213,337
Palmyra branch	10,638	208,980

ASSESSMENT OF RAILROAD LINES—Continued.

Name of road.	Value per mile.	Aggregate value in State.
Kansas City, St. Joe & Council-Bluff	10,610	1,568,266
Atchison branch	6,612	8,109
Hopkins branch	7,112	384,920
Nodaway Valley branch	6,112	196,053
Tarkio Valley branch	6,112	158,203
Leon, Mt. Ayr & Southwestern	4,797	244,776
St. Joe & Des Moines	5,883	287,925
St. Louis, Keokuk & Northwestern	8,364	1,053,430
Chicago, Milwaukee & St. Paul	9,411	1,360.975
Chicago, Santa Fe & California	12,575	2,496.077
Chicago, St. Paul & Kansas City	8,947	565,942
Crystal	11,870	41,545
Des Moines & Kansas City	2,044	25,055
Eureka Springs	8,128	66,015
Interstate Rapid Transit	31,478	20,387
Kansas City & Southern	5,815	660,303
Westport branch	5,815	48,213
Kansas City, Topeka & Western	164,738	228,934
Kansas City, Ft. Scott & Memphis	15.148	1,416,139
Ozark division	11,194	1,580,034
Rich Hill division	8,096	163,523
Short Creek & Joplin division	7,096	96,366
Missouri & Kansas division	7,096	50,536
Current River	4.380	369,725
Kansas City, Clinton & Springfield	7,247	1,112.221
Kansas City Belt	62.841	457,912
Kansas City & Independence	8,795	72,775
Kansas City, Ft. Scott & Southern	2,900	99.462
Keokuk & Western	7,080	503,328
Manufacturers'	75,000	50,250
Mississippi River & Bonne Terre	5,641	181,140
Missouri, Kansas & Texas	10,612	2,152,634
Missouri Southern	1,207	17,125
Missouri Pacific	18,462	5,361,530
Boonville, St. Louis & Southern	4.563	206,520
Carondelet branch	5,831	67,075
Kansas City & Paola branch	6.155	128.914
Lexington branch	7,966	439,094
Kansas City & Eastern	7,966	346,185
St. Louis & Creve Cœur Lake branch	5,912	70,540
Lexington & Southern branch	9,433	1,252,765
Lebanon branch	3,867	168,455
Marshall & Boonville branch	4,956	395,220
Nevada & Minden branch	5,787	188,835
Leroy branch	4,218	155,408
St. Louis & Emporia	3,970	62.493
Oak Hill branch	15,681	99,795
Warsaw branch	3,276	140,010
St. Louis, Iron Mountain & Southern	14,690	2,733,129
Belmont branch	6,793	318,403
Cairo, Arkansas & Texas branch	5,293	377.048
Doniphan branch	3,793	76,571
Jackson branch	4.293	70,785
Potosi branch	3,292	12,553
Omaha & St. Louis	8,164	652,426
Quincy, Omaha & Kansas City	5,100	696,749
St. Joseph Terminal	13,510	107,750
St. Joe & Grand Island	25,692	3,340
St. Joe, St. Louis & Santa Fe	7,845	748,094
Lake Shore branch	6.696	10,478
St. Louis, Arkansas & Texas	5,848	409,301
Delta branch	5,848	312,072

ASSESSMENT OF RAILROAD LINES—Continued.

Name of road.	Value per mile.	Aggregate value in State.
New Madrid branch	2,848	16,006
St. Louis & Suburban	10,663	185,530
St. Louis & Hannibal	4.817	401,425
St. Louis, Kansas City & Colorado	4,028	225,055
Terminal Railroad, St. Louis	107,000	659,120
Tunnel railroad	107,000	100,580
St. Louis & San Francisco:		
St. Louis to Peirce City	10,493	3,365,001
Peirce City to State line	7.440	
Springfield & Northern branch	4,940	193,604
St. Louis, Arkansas & Texas branch	5,981	195,364
St. Louis, Salem & Arkansas branch	4,940	208,166
Joplin Railway branch	5,440	111,609
Missouri & Western branch	9.953	441.615
Oronogo branch	4,940	47,748
Joplin & Galena branch	5,440	33,189
St. Louis Transfer railway	4.656	56,760
Union Pacific	401,039	209,119
Waldo Park railway	5,200	52,000
Wiggins Ferry railroad tracks	7,500	29,250
Wabash	15,115	4,385,812
Northern branch	5,685	513,809
Brunswick & Chillicothe branch	8,018	312,587
St. Louis, Council Bluffs & Omaha	8,018	333,639
Glasgow branch	3,861	59,325
Boone County & Boonville	4,880	106,767
Hannibal Bridge railway	23,115	19,555
Williamsville, Greenville & Northeastern	2,360	23,600
Total	....	$59,059,473

BREEDING.

BY GEO. HARNED.

Paper read before the Farmers' meeting, Tipton, Mo., Jan. 14, 1891.

The subject of stock-breeding is one that is broad in its scope and varied in its parts, and has been thought important enough to attract the attention of mankind from the earliest period of which we have any recorded history. It seems to have been a more approved enterprise so far back than even agriculture, inasmuch as its fruits were acceptable, while the products of agriculture were rejected in the offerings of the first sacrifices made on earth to the Supreme Ruler of all things, and probably, my friend in requesting me to write a short essay on this subject, had in his mind the man who, on being asked to make a five minutes talk, replied by saying, if he had to talk five minutes, he would desire the world for his subject. But be this as it may, the most exacting could not complain of the want of latitude.

I suppose that one-half of the world breeds stock to some extent, and just how large a proportion of these have any thought or conception of the results to be obtained we cannot say, but are sure that a large proportion of our breeders have no more idea or thought of the results to be obtained than the animals they couple. Or, if they have any thought at all on the subject, it seems to enter no farther than to obtain a colt, a calf, a lamb, or a litter of pigs, without any idea of value or what kind of animals to use to obtain this value.

We have another class who are desirous of improving their stock, and might make some progress in that line, but are baffled by the want of sufficient means to get such animals as they might desire; but this class is small now compared to what it was when good animals brought fair and sometimes fabulous prices.

Besides these two classes, we have a third class, whom we will call the manipulating class, whose occupation is similar to the manipulators of the stock, grain and provision market, but the results of which are far more disastrous. Those who speculate and control the commercial markets cannot deteriorate the quality of the grain or the provisions which they corner and control. The palatability and life-sustaining qualities remain the same in a barrel of pork, a bushel of corn, wheat or oats after it is cornered as before. It is impossible for the trusts or combines to affect the intrinsic value of the article one particle; but not so with the combines and manipulators in breeding stock. The question may be asked how any combination or manipulation could affect quality or real value of the stock in the breeding of which he is engaged. To answer this question, it will only be necessary to refer to a few cases, which have, no doubt, fallen under the observation of most of our oldest breeders, and as I am more familiar with the breeding of cattle, I will select the examples to prove my proposition from this class of stock, but have no doubt that all classes of stock would be subjected to the same conditions.

The first example I will refer to will be the ostracising of the importation of 1877. In that year there were imported, if I remember right, by Mr. Sanders of Kentucky, three bulls, Comet, Tecumseh and San Martin, and three cows, the Durham cow, the Teaswater cow and Mrs. Mott, the most of which proved to be good and prolific breeders, and their increase became scattered all over the country. About this time a few breeders got it into their heads to create prejudice against these cattle, which was easily done by a half-dozen breeders announcing that there was already a prejudice against them, the desire being father to the thought; and while the men themselves who started the cry of wolf would acknowledge the 1877 importation to be as good and pure Short-horns as any, the howl was raised, and although such men as Edwin Bedford, Wm. Goddard and others almost broke themselves by throwing themselves into the breach and trying to reinstate them in the position to which they were justly entitled, the breeders of the country were robbed of this large body of most excellent cattle, that a few of the leading breeders, who have an extended reputation, might dispose of their surplus at fabulous prices. And, whatever may be said of the good sense, pluck and tact of a large majority of our breeders, they have never been able to redeem this large and worthy class from the odium and ostracism to which they have been brought by a few unscrupulous manipulators.

Now, emboldened probably by this effort to render unfashionable and unsalable this large class, another effort was successfully made to establish a Royal family, but the duration of which was short. The culminating point of this was reached at the New York Mills sale, where one cow was sold for $40,600, and if I remember right, nothing of this family brought less than $10,000.

But fortunately for the welfare of the country, the good sense of the people has affected itself, and the down grade in prices has been so rapid that I imagine no breeder of the pure Eucher has been able to raise these fast enough to keep the value of his herd up to first cost. The animals bought at that sale, if they were to be judged by their individual merits, would, I think, take their stand about the bottom among the families of pure bred Short-horns. We might refer to the Rose of Sharons, and others, and while the breeders who established the family made it profitable, the outcome of all those who have confined themselves to the same family and line has been disastrous both to the breeder and the cattle bred; and why should it not? How could we expect as good results when confined to one small family in selecting our bulls, as we could obtain when we had one hundred times as many as good and pure animals to select from?

There is another class of professional breeders to whom we look and indeed who have furnished all the distinct breeds and types of the various kinds of stock. This class appears to be controlled by a more honorable and noble purpose. They, I imagine, subordinated the pecuniary interest to the more commendable one of obtaining their ideal type of the animals they breed. We would think those entitled to all power who have produced the perfect horse for the service we desire them to render, which we observe in the racer, the trotter, Norman and Clyde, and yet all these distinct types, with many others, have been produced by the intelligent breeders. It would probably be assuming too much to suppose that this class ever expected or anticipated the good results which we now observe as the fruits of their efforts. But acting with the best judgment they possessed, they have by judicious coupling and the advantages of climatic influences, produced these types which are so well suited to the various uses to which they are subjected.

We might mention other benefactors of mankind, who have produced the Short-horn cattle, the Hereford, Holstein, the Jersey and many other breeds of this class of stock adapted to the different countries and people. The same might be said of the Cotswold, Leicester, Shropshire, Southdown and numerous other breeds of sheep, not to mention the Berkshire, Essex and Poland-China hogs, and even the turkey, chicken, and even dogs, have come in for some consideration in their desire to produce the best type of these species to perform the requirements of the human family.

I hope and am persuaded that the knowledge of how to manage the conditions and environment is increasing, and that we may look for much further improvement in the domestic animals of the future. We learn from sacred history that some knowledge of this art was acquired or understood by Jacob when attending Laban's flocks and herds in the land of Mesopotamia, but we have no idea or suspicion that the knowledge of that day was extensive enough to produce a Norman horse or a Short-horn ox. This class have performed their part, and I think performed it well, and I am sorry to say that our noble America has performed so little part in this laudable industry, which has done so much for the human family. While Americans are probably as easily humbugged as any other people with equal intelligence, they enter very reluctantly into any enterprise that does not offer a reward at the end of the race. They seem to be a verification of Tennyson's verse where he says:

"The good, the true, the pure, the just,
Take the charm forever from them—
And they crumble into dust."

The rustling, wide-awake American is ready for any emergency and is not set back by any obstacle, so the incentive is the enlargement of his coffers or promises its equivalent in pleasure or happiness, whose characteristics are fully expressed in the following verse from the same author:

"Who, rowing hard against the stream,
Saw distant gates of Eden gleam,
And did not dream it was a dream."

SHORT-HORN HERD, PROPERTY OF B. O. COWAN, NEW POINT, MO.

THE SHORT-HORNS.

BY S. C. EASTMAN, OF PALMYRA, MO.

Read at the Marion County Farmers' Institute.

It is not that I am a speaker, but rather as a breeder of Short-horn cattle, that I have been requested to present the claims of this breed as a profitable one for the average American farmer to handle, and especially those few who may hear or read what I say. Whilst I am a friend and breeder of Short-horns, I am also a friend of other good breeds of beef cattle, the Angus, Hereford and Galloways, and am like the old maid, who said "anything, oh, Lord." We must have relief from these awful scrubs, the breeding of which is sucking out the financial gain of Missouri farmers to-day, and will continue to do so, until you are forced by your great losses, and the suggestion of your friends, who are trying by word and deed to show you the fault is your own, and that it is with yourselves to get the relief if you will. I would not have you think that it is because I am a breeder of Short-horns that I will say what I have to say, but as your friend, your neighbor, one of you.

To-day, we in Missouri, and a large portion of the entire West, are suffering from a severe drouth, that, commencing early in July, and lasting five months, is burning up the pastures and meadows, cutting one-half the corn and fodder crop. Stock is getting only the worst of water. What is the position in which the average Western farmer finds himself with a lot of half-starved stock, no feed of your own, and none around you to buy, even if you had money to buy with? Your stock not in shape to sell on the market, and your neighbor not able to buy them—you can't feed them—something must be done, and you, and all the West must unload. You seek a market somewhere at some price, a friend to buy your stock. They come—who are they?

I approach a subject in a manner that many of you may have never discussed, and without discussing, not appreciated. Your greatest friends are those you have most condemned. I refer to the "Big Four," or the great cattle-killing companies of Chicago, where three-fourths of the cattle of the entire West are handled. These great concerns, by capital, buildings and wonderful processes for gathering, killing, packing, cold-storing and distributing the product all over the world, some in carcass, some in cans—every hair, bone and ounce of the animal put in shape by the highest scientific and most economical processes, and sold to the consumer to the best advantage—are able to place your stock, even your old poor scrubs, as well as your fancy beeves, at values one-fourth more than you could possibly get if they did not exist. Their existence, with the thorough systems of work in their line, their ability to buy and pay on any day for all you have, good, bad, indifferent, even the old lousy scrubs and the fancy beef, and to pay you all it is worth, and more than you could get, by any other means any one of you can suggest, is a good thing for you.

You yell out, can't the farmers combine and do all this and divide the profits? No; how extremely absurd. When you had got a few to subscribe, or enough say to establish one packing establishment (not a dozen), and before it is in working operation, all sorts of difficulties and fatal conditions would arise amongst the so-called managers, and the thing would certainly fail with much loss.

Then quit abusing the packing companies who are buying and paying fair prices for all you have, both good and bad, and instead of robbing you, are the very best friends you have. Quit abusing the railroad companies that are hauling your stock for less than it is worth. Quit kicking the feeders and shippers who are taking all the chances for you, that they dare to do.

What is to be done? Some have and others wish to raise cattle. The farmers of neither this county nor State can give up cattle raising; they must keep and grow them as a part of their great system of routine in farming, and they must improve upon the present methods. Look at your own cattle and those of most of your neighbors. You find old bony, scrubby cows, that would be dear at $15 per head, bred to some little ornery red bull roaming around the country, that is o. k. if he gets a calf.

Are you raising the type that will sell at from 5 to 7 cents, or are you and your neighbors growing and feeding the bony, slab-sided, poor quality steers that can't be made to reach over 3 cents? I ask to-day any feeder under my voice, if it is not easier to take a well-bred, smooth steer, having feeding quality, and at 30 to 36 months of age make him reach 1,400 pounds to 1,600 pounds, and have the quality to reach the top, which is now 5 to 6 cents, than it is to take the average Marion county grown steer and make him reach a weight of 1,000 to 1,200 pounds at the same age, and which, without quality, goes begging at from 2½ to 3 cents, proving a loss to the breeder and feeder? Why is this difference? One has the good shape and quality, and which cuts up profitably, the other the bad shape and want of quality. The quality steer sells for an average of about $75, that of your neighbor and yourself for $35. Look at it fairly: is it your fault or that of the consumer? Are you and your neighbors growing the kind that are wanted and sell well, or are you growing the cheap trash? Answer for your neighbor (you won't for yourself).

You can't expect buyers to pay you a good price for poor stuff, though they are always ready to pay a good price for good stock. Here is a loss of energy in growing and a loss of money in not producing better cattle. Shall we try to correct it? A few will say yes, but I fear great the mass will go on as before. The few will inquire how, and to them I would answer, keep and buy the best cows you can afford; and be certain to breed them to a good thoroughbred bull. You can buy them cheap now. Don't pick up some so-called grade calf that is red, with nothing else to recommend him. If the number of your cows do not justify you in buying a bull alone, have one or more of your neighbors join with you; then follow up that bull with another thoroughbred, and soon your cattle, male and female, will bring the top figures, and cattle will be profitable in your hands.

If you have decided to improve your cattle by breeding first, then by feeding, I am ready to recommend the Short-horn as being the best type of cattle yet produced. Their claims to this position have been established far back and maintained for over 100 years, as the best in early English and late English fairs. In early American and recent fairs, Short-horns have ever been to the front. I will here call attention to the exhibits at the State fairs, east and west, this fall, wherein the Short-horns were at the front; also, at the American Fat Stock show at Chicago, Short-horns went to the front again. At the greatest of English beef fairs just past, Birmingham and Southfield, a Short-horn cow, a roan, by a Scotch bull, took the highest honors.

I must here speak upon another feature, one that has done more to break down the true development of good cattle than can be estimated, and that is the foolish color-craze for dark red. If red and dark red, no matter how shaped or how bred, keep him for a bull, and make a steer of a roan, much higher bred and better individual, although feeders and breeders have learned the difference; and now that fancy families and blood lines have gone to the wall, and judges must look to beef qualities instead of fancy pedigree and red color, and the prize takers all around, both in England and America, are roans, descending largely from the Scoth Cruickshanks-bred cattle that to-day lead all the others at the fairs and butchers' stall. Days of fancy pedigrees are gone. Beef is beef, and the low, heavy, broad-shouldered, deep-ribbed, long, square, full-quarter, and feeding qualities of the Cruickshank Short-horn make them the most desirable feeding cattle now or ever before on this earth.

I will not detain you now to go into the early history of this breed of cattle, nor of those grand early breeders, Collings Bros., Thos. Bates, Booth Bros. formerly, and Amos Cruickshank lately, who have so distinguished themselves as breeders. I will not speak of the fools who ran the line and family breeding until one cow sold for $40,000 and a bull for $22,000, and many hundreds at from $2,000 to $15,000, and so inbred that constitution and quality were impaired and destroyed. I must speak of Amos Cruickshank, a Scotchman, who about forty years ago got together a herd of the best beef Short-horns, all thoroughbred, but not following any fancy pedigree, seeking and breeding for beef quality, and finally gaining a success for the herd that to-day are at front on both sides of the ocean, compelling nearly all the breeders of Short-horn herds to seek for a Cruickshank bull for the head. All in all, I feel that the Short-horns are the best cattle for our farmers to raise, yet I respect other breeds. There must be better-bred and better-fed stock to get the big profit.

SHEEP HUSBANDRY.

Read by C. S. Jeffries at the Franklin County Farmers' Institute.

Franklin County, December 29, 1890.

Since the Almighty has issued His wise decree, that man should earn his bread by the sweat of his face, and not live by bread alone, we should endeavor to observe the injunction.

Who will dare say that the decree was not a wise one?

Every trade and profession of man owe their existence to the products of earth. Who else but the farmer, with the sweat of his face, furnish bread for the nations of the earth? Who has less protection than the farmer? Who should, of all the professions of men, receive care and protection from the government more than the farmer?

Without agriculture the earth would become a dreary waste, and man would perish from the earth.

In regard to Sheep Husbandry, I am persuaded, from my own experience in sheep-raising, that it is the most profitable industry the farmers of Franklin county engage in, and am at a loss to know why so few have sheep farms.

The St. Louis market so close by, farmers could always find a ready market for the wool, mutton and lambs.

It is clear that there is less profit to the farmer in other kinds of stock than in sheep; besides sheep are yearly enriching the farm.

Sheep require no grain, except oats for ewes in lamb season. Hay and pasture is all they require. Ewes go five months. Bucks should not be let to run with the ewes before the first of November, so that the lambs will begin to drop about the first of April.

Hired labor, to raise corn and wheat, and cattle at the straw pile in winter, yield no oil to the farmer, in my opinion.

SHEEP HUSBANDRY.

By D. M. PROCTOR, Palmyra, Mo., read at the Marion county Farmers' Institute.

I suppose you who are farmers would prefer hearing this subject discussed from a financial standpoint, as there are few farmers or stock men in this part of the State who are tilling the soil or handling stock as a matter of pastime, or because they are especially attached to any particular crop or kind of stock.

I have kept a condensed account of my experience with sheep, as well as with my other stock, for the last eight years.

In 1882 I sold 578 pounds of wool at 22 cents per pound; have no account of number of sheep or lambs. In 1883 I sheared 68 sheep and sold 415 pounds wool at 21½ cents, which reached a fraction over six pounds to the head, or $1.29 per head for wool. In 1884 I sold twenty-five sheep, of 132 pounds, at 2½ cents per pound.

In 1885 I sold 650 pounds of wool (an average of 6¼ pounds per sheep) at 17¼ cents per pound, which I think is the lowest price I have sold wool in twenty-five years. Also in that same year, in November, I sold 48 sheep, average weight 97 pounds, at 2 cents. I don't remember what grade sheep they were; it is possible part of them were lambs; have no record of my lambs that year. The year 1885 gave the lowest prices for sheep and wool that I remember.

In 1886 I sheared 500 pounds wool off 96 sheep, about 5 1-5 pounds to the sheep that I had, but I was running my sheep toward the Southdowns blood, and I concluded I had them close enough to that breed. That year I raised 70 lambs from the 96 ewes, sold the wool for 18½ cents, and July 21, sold 50 lambs at $1.75 per head. I think this the lowest I ever sold lambs, and within a cent of the lowest per pound for wool. Now putting the whole 70 lambs at same price of 50 I sold, and adding price of wool, makes total of $2.15, or about $2.24 for the 96 sheep in the year.

In 1887 I sheared 99 sheep and sold 681 pounds wool at 22¾ cents; raised 85 lambs and sold 44, August 23, for $86, or $1.95 per head.

In 1888 my 92 sheep sheared 590 pounds wool at 20 cents, raised 100 lambs, a part of which I sold, and the average per head for old sheep for the year was $4.20.

In 1889 my 100 sheep sheared 612 pounds wool at 26¾ cents, and raised 110 lambs, most of which I sold, and counting others at same price, my 100 sheep averaged $5.09 per head for the year.

The present year my 100 ewes sheared 766 pounds wool at 25 cents, raised 112 lambs, 92 of which I sold at an average of $4.14 per head; counting as before makes my sheep average me $6.61 per head.

This is the most profitable year I have ever handled sheep, and 1886 I think the most unprofitable. Putting the two together, in 1886 the amount per head was $2.24, which, added to $6.61 for this year and dividing by two, makes an average of $4.42½ per year, which I suppose will not be far wrong for the eight years.

Now this $4.42½ represents a little too much, but just how much I am not prepared to say. Except for the past year, I have kept no account of losses on account of sheep and lambs dying or being killed by dogs, but I am pretty well satisfied that 5 per cent will cover my losses since I have been handling sheep. Counting the lambs after they get to be two or three weeks old, my losses this year have been heavier than common, as I had four old sheep die, and some six or eight got out and strayed away or were stolen. But if I should sell my flock down to the number I had one year ago, my 100 head would still make an increase of $6 per head.

Now, having given you this much of my experience, I will give you some of my conclusions and reasons therefor.

As to the best breeds of sheep, I have tried crosses of the Leicester, Merino, Cotswold and Southdown, always aiming to use full-blood males. If I had my choice of the kind of ewes, I would have them about one-third Southdown and the other two-thirds Cotswold —the Down blood to make the quality of wool fine, and I think the Down sheep make better mothers—the Cotswold blood to increase the quantity of wool and add size and bone to the sheep. Another reason for wanting a cross between two different breeds is that I think crosses of that kind make healthier, more robust animals than the pure blood of either breed. I notice in the report of the last fat stock show in Chicago that the grade cattle gained more per day than any of the pure breeds.

As to the management of sheep, I aim to adopt what might be termed a cheap plan. The past year I don't think I have fed over six or seven bushels of corn, and no other grain, and that was fed to my wether lambs during the last six weeks. I keep my sheep on timbered pasture with cleared spots in it in the summer time, except when running on stubble fields after harvest. In the winter they run on my meadow and blue-grass pasture (not meadow to be cut next year), and they have free access to the shed of hay.

When the winter is very hard I sometimes feed an ear of corn a day for a month or two. I sow fifteen or twenty acres of rye early in the fall, and on this I winter my ewe lambs and have it ready to turn my ewes on a few days before the lambs begin to drop in the spring. I arrange for my lambs to commence coming about the first of April, because by that time I have grown rye and grass for the ewes to graze on, and the weather is warmer and more settled, and thus save a much larger per cent of the lambs and at a decided less cost. Another reason for waiting till the first of April is that the drain on the sheep's system in supporting the lamb on grass or green feed is not so great as when on dry feed and coupled earlier; hence, the wool is not checked in its growth as early or as much, and I get more wool at shearing time. I mark and dock my lambs when not over two weeks old. The reason for marking young, I suppose, is too evident to give.

I sell my lambs in September, as near the last as can, or if I don't sell I wean the first of October, although this year I weaned October 1st and did not sell until October 7, and other lambs November 10. My wether lambs, forty five head, averaged when sold 99½ pounds.

Just before shearing I examined my flock and marked all that have bad teeth, and enough others too, the worst, to make from fifteen to twenty; these I sell or eat during the season, and fill their places in the flock with choice lambs.

Another conclusion I have come to is that it takes eight or ten sheep to eat as much as one three-year-old steer or horse, or in other words, as a rule, stock of all kinds eat in proportion to their size. Eight sheep averaging 100 pounds will eat about as much as a steer or horse weighing 800 pounds, with this advantage in favor of the sheep: they will eat more coarse feed, such as weeds, briars, sprouts, etc. I believe that one sheep to three acres of pasture land can be kept on a farm, if properly managed, and the farm will support as many cattle and horses during grazing as though there were no sheep. I think the amount of weeds and other rubbish the sheep destroy will allow the land to produce as much more grass as they will eat.

Now take the $4.42 which I concluded my sheep made me per head through the last eight years, and deduct the 42c for losses, which surely would be enough, leaves $4 for keeping a sheep a year and the lamb till weaning time. You can get a steer grazed through summer and roughed through winter in this section for 75c per month, or $9 per year. Putting the eight sheep at same price for keeping, if you get $12 for keeping a steer a year without feeding grain you will be doing well, which gives you $3 over the cost of keeping.

For your eight sheep you will get $4 per head or $32 which is $23 over cost of keeping, a difference in favor of the sheep of $20. If you add grain to the rations of each, I am satisfied you will get as full returns from the sheep as from the steer, although I have never experimented on that line.

You may be ready to ask, if sheep are so profitable why not turn all your stock into sheep? I think if you graze pasture to its capacity with sheep alone, they will become unhealthy and not do well. I would advise not more than one sheep to one and one-half or two acres of pasture. Another advantage in sheep is on account of the size; one or two families can eat one during warm weather before the meat spoils. My family have eaten as many as eighteen during one season, but it was when they were lower than they are now. As to loss by dogs, I think five or six will cover my loss in the last twenty years.

In 1880 I sold my wool at 34 cents per pound, in 1885 for 17½ cents per pound, the highest and lowest sales I ever made.

WOOL-GROWING AND SHEEP HUSBANDRY.

A paper by I. N. Newkirk, read at the Laclede County Farmers' Institute.

Here we are in for a paper on sheep and wool-growing in Southwest Missouri, and it is like its author, sort of rambling. In the first place, we all have different ideas and fancies for different breeds of stock, and we farmers select, grow and handle that which we think we can make the most money out of. Some farmers will grow calves into beeves, and to make good beef he has to graze and feed from three to five years. Some of us, indeed all of us, fancy good horses, so we take a colt, work and watch for wire-fence blemishes, distemper, pinkeye, and keep a sharp lookout for glanders, along with a great many other diseases; so we pull him through for five years; then he is at a marketable age and reputed to be well broken to harness and saddle; then he is fattened and put on the market, so it takes five years to make a marketable horse. Then comes the hog; it takes from twelve to eighteen months and lots of corn to make a good hog, and lots of hogs to make a little money. These classes of stock are all necessary to farm and city life. Now we come to the sheep; they give us three returns every year, and any one of them will more than pay expense of keeping, namely, wool, mutton and lambs. Hence this paper will be devoted to sheep husbandry in Southwest Missouri. The sheep industry ought to be revived, and every inducement given to encourage it, and there is no farmer goes at it but makes it pay.

Many of our farmers are going largely into fruit-tree planting, and it is believed now and said by some, that Southwest Missouri will be the orchard of the world; why may it not be the wool and mutton-growing region of the great Mississippi Valley? There are some good reasons why orcharding and sheep-growing should go together. First, sheep is the only stock you can pasture your orchard lands with. Horses and cattle destroy both trees and fruit, while sheep are our greatest fertilizers and scavengers. Of all domestic animals, it is so distributed that every tree is benefited, so you will find that by keeping sheep, your trees are kept vigorous and fruitful. Then at other times we have late frosts and freezes that make a partial failure of our fruit crop; then comes in mother sheep with her crop of wool, lambs and mutton; so with her yield and a light crop of apples you will come out all righ .

I want you to bear in mind that when you get a flock of sheep and you do your part as a shepherd, you will always have wool and sheep to sell every year at paying prices. Some raisers of mutton-sheep claim they can make a profit from mutton, entirely void the fleeces. We all know it takes no more to make a pound of mutton than it does a pound of beef or pork. By market reports mutton is considerably the highest, so you see we have the price of a good heavy fleece of wool over the low price of beef and pork. It certainly behooves us farmers to look around for some other industry that will tend to lessen the production of beef and pork and give better financial results; hence we want to get up an interest in sheep, and when we are getting up our flocks, let us remember that the value of them will not be estimated and valued by its numbers; it must be the income that each individual sheep will yield in wool and mutton that will have to determine the value of flocks, and that will depend largely on the breed of our sheep and the care we give them.

If we want to make mutton a specialty, we want the large breed; if we breed for mutton and wool combined, we want the large merino. Don't think that all you have to do is to get up a bunch of sheep and turn them out on some old field to eke out an existence on old dead weeds and stubble, without feed and protection from the pitiless storms, the curs and the bird-dogs that are destroying our sheep. To do justice to the dog it would take a whole paper. The cur is the great barrier to the best and dearest interests of the flock owners; they deter timid and careless men from going into sheep husbandry, which is the best paying industry we can now engage in. I have often read of the great advance made in agriculture in counties and districts where they kept the golden-hoof sheep. That is what they are and what they will be to us if they are intelligently and kindly handled; they have no peer to-day standing on Missouri soil. The fact is that sheep have never been unprofitable, but it became the rage with the farmers to raise hogs and cattle, and for many years the prices were fairly remunerative; besides there is a rage for cultivating the entire area of our cultivatable land, and the average farmer had no room for a sheep pasture. Now let us get up an interest for more grass. Sheep are great fertilizers and every farmer that has well-nigh exhausted the fertility of his land will find in them a renovator that will restore fertility to his fields, destroy the noxious, weeds and at the same time fill his pockets with the almighty dollar.

It is not for the value of the wool alone that the farmer desires to go into sheep, for it is a fact that there is an increased and an increasing demand for mutton, and those breeds which are best adapted for mutton are now in good demand. They tell me the day was when all farmers kept a few sheep in this country. The facilities for raising them were not so good then as now; blue grass is now general, also white clover and all the summer grasses that are peculiar to the soil and climate of this part of the State. This being the case now, sheep will not require near so much feeding as they did then. Climate has a wonderful effect on the growth and fiber of wool, and perhaps the quality of feed has equally as good an influence; and to illustrate this, it is well known that our Missouri wools are among the standard wools of the country.

We think the best breeds for mutton are the Southdowns and Hampshiredowns. We need more good mutton sheep in this country. The fact is that we as a people are ignorant of the excellence of really good mutton. Canada usually furnishes the best we get in the East, the rich pastures of Kentucky send the best we get in the West. To obtain good mutton we must have a good breed of sheep, that with proper feeding takes on an abundance of lean meat, that is fine grained and juicy; those breeds that convert their food mainly into fat, and put in solid masses outside and inside the carcass, cannot be prime mutton sheep. The Downs rank before all others as mutton breeds. The Merinos rank second to none. You also get a superior mutton sheep by making a cross of Merino and Southdown rams on our common native ewes. These crosses make a sheep of great constitutional excellence, early maturity, great vigor and hardiness, and ability to stand hard usage on short feed in summer drouths. The ewes are prolific, good milkers and are quiet and motherly. Every good mutton butcher in our cities prefer the grade Merino to all other sheep, especially if crossed with the black-faces. There are no such fancy lambs taken to any market as the Southdown Merinos.

Again, there is a family of the Merino bred to a mutton standard and form that promises to be equal to the best black-faces in every respect. Their size equals the Southdowns and surpasses the average of the country. The number of Merinos indicate that they are in this country to stay; they have not tried to make a mutton reputation, yet they have a good one in the regions of the best markets on the continent. The British mutton breeds, with the unquestioned reputation which they bring to this country, rather than the small per cent which they represent in the number of sheep in America, have a valuable place in our sheep husbandry, which ought to have been fully maintained. I have spent about a lifetime in Merino culture, and shall present the Merino side of the question. The recent past has been fraught with some disappointment, but not with loss. The future dangers are more imaginary than real; an industry which contributes largely of practical benefit cannot long be suppressed; we cannot forcast the future by the past.

The native American flocks are of little value either as a wool or mutton-bearing sheep; the Merino imported into this country early in this century, whose progeny now represents the American Merino, is to-day without a peer in the world. As a fine-wool and mutton sheep it has an embodiment of all the good qualities of the sheep race. And the man who goes to growing them will not be the least prosperous of farmers. Let us breed them for constitutional vigor and mutton form, keeping the mutton quality first; let us always keep them, as they are without a peer for mutton and wool. The Merino has rapidly spread from a few of the older States to the great sheep pastures of the West; they are firmly established from the Atlantic to the Pacific coast. The importance of the breed not only in producing the most wool, but the most valuable wool, and it is generally admitted to be the best, all-round sheep for the farmer..

The American farmer who wish to build up a flock of sheep takes the Merino for his basis, and a grand foundation it is. Before the introduction of the Spanish Merino, very little attention was paid to sheep-raising, and the flocks were, as a whole, the degenerate offspring of an unimproved English sheep. The wool was coarse, the fleece light, and the mutton poor, so we owe our present standing as growers of wool and mutton to the importation of pure breeds. And now, in conclusion, I say to my brother farmers, when you get ready to go into the sheep and wool industry, and I hope you will get ready soon, the first thing to do is to get ready for it. One essential is a good, double-barreled shot-gun, and whenever you have an opportunity, let the curs know you have one. Do not want to get too many sheep to start with. Always remember "a little farm well tilled makes a barn well filled." In selecting rams, I would advise Southdowns or Merinos to cross up with. If you use Merinos, select rams that will weigh 125 to 150 pounds, with good mutton shape. They should be bred to that type that will yield the greatest quantity of wool as well as mutton. A sheep having a good constitution, large carcass, close wool and oily fleece, is my ideal.

THE HOG.

IRA K. ALDERMAN,
Secretary Poland-China Record.

Read at the Nodaway County Farmers' Institute.

MR. CHAIRMAN—That I should be selected to address a Farmers' Institute on the swine industry, as relates to the farmer, seems a little strange. Though I have by association and a very limited experience learned some things as touching this industry, both to the breeder and the general farmer, I certainly cannot lay any claims to special knowledge, or even to general experience. I assume you do not care for any extended history of the hog, nor any comparative view of different breeds. To do this, I would endanger my personal safety. If I did not do justice to the red sandy fellow, my friend Col. Harman would cease to be my friend, I fear, and I dare not court such a calamity. And so among the Berkshires, the Chester White and other favorite breeds. I now have friends I do not care to lose by extolling the merits of that superior breed, the Poland China. Very well, then, I shall pass away from this feature and allow the farmer to select to suit his own view, and we will call the hog a hog, whatever be his color or pedigree.

I do not find general statistics since tenth census, and cannot rely on estimates made since then, though shall use some perhaps of later date.

Swine are important factors in the production of wealth and subsistence of man, in all civilized nations almost, but especially so in the more christianized.

The ancient Egyptians were unfriendly to the hog and denounced the porker as unfit for food, and the Jew and Mohammedan alike pronounced him unclean. The Hindoos and Buddhists also, most of them, repudiated the swine from earliest history. So you see, between the anti-christians of the world, the mud and filth of unclean hog pens and hog lots, the porker has had a hard time of it, and is much indebted to the meek and lowly Nazarene for his present exalted position in the world. The French people, who seem to have thought more of their French wines than of American swine, have also been unclever to the American hog, but a meat and live-stock inspection law of recent legislation has already had beneficial effects, and even the lop-eared porker can prick his ears and look up hopefully.

It has been stated that the first swine importation was in 1493, by Christopher Columbus, on his second voyage to this country. However this may be, the hog is an imported animal, and present breeds mainly had their origin in whole or in part in England and China. The imported breeds are mainly the Berkshire, Yorkshire, Essex and Suffolk, the latter being the oldest known pure breed of swine. The principal American breeds are the Chester White (originating in Chester county, Pa.); the Duroc or Jersey Red, for fifty years bred in New Jersey, and the Poland-China, originating in Ohio mainly, the newest and I think the most numerous hog in America, if not the most popular and profitable. In the last twenty or twenty-five years the Poland-China has developed mostly its present high state of perfection, though a breed properly dating much further back. Much attention has been given to pure-bred swine in the last fifteen years, and since a system of registering pedigrees was established, about thirteen years ago, the development in all breeds has been wonderful, and especially in the Poland-China, and in like proportion has the farmer been benefited.

I have no means at hand for estimating the number of registered hogs except as to the Poland-China, and perhaps a statement showing results as to this breed may give an idea as to others, and furnish material for thought.

The Ohio Record dates back thirteen years; the American Record, twelve years; the Central Record, ten years; the Northwestern Record, six years, and the Standard Record, headquarters here, four years. Without counting repetition by one record from another, I make the following estimate of recorded animals by the respective records above, namely:

The Ohio P. C. Record	42,300
The American P. C. Record	27,800
The Central P. C. Record	15,900
The Northwestern P. C. Record	3,000
The Standard P. C. Record	16,500
Total	105,500

This is not a bad showing for the youngest breed of swine in the world. Perhaps I am drawing this too strong, because there are two or three new breeds that are more recent, but that have not reached much prominence. My comparison is intended to apply to names above given.

The Department of Agriculture at Washington, D. C., estimated as of date January 1, 1889, that the total number of swine in the United States, on farms and in ranches was 50,000,000 heads, with estimated value of $6 per head, or a total of $300,000,000.

Alden's Manifold Cyclopedia, the latest cyclopedia authority I know of says: "The annual sales of swine bring more money to farmers than any other class of live stock, and in some years receipts from swine exceed those from all other animals combined."

If this be true, certainly the farmer should look carefully to the hog industry and its development.

Let us make some home comparisons. From county records furnished me by our present county clerk for 1889, I find the Nodaway county assessment as follows:

Horses, 20,444, valued at	$674,404
Cattle, 64,242, "	582,608
Sheep, 2,286, "	2,170
Swine, 60,118, "	134,901

This assessment, like the Jew and Mohammedan, does injustice to the swine. Average valuation of swine is estimated at a little over $2 per head. As sucking pigs are not taken into the account, I regard the valuation by Department of Agriculture nearer correct, relatively, at $6 per head. On this basis the swine of this county in 1889 would be $660,708. Thus estimated, the swine valuation exceeds all other classes of live stock except horses, and only a few dollars under them.

The fact that money can be turned more readily invested in swine, and brings quicker returns, has made the hog a favorite to the rushing and pushing American.

And I venture to add by way of suggestion, that when farmers have learned that careful treatment as to breeding and general caring for is as important as to other live stock, they will find still greater profit in swine than at present generally understood. Breeding too young, carelessness as to cleanliness, and various matters of common neglect have been claimed by high authority as a prolific source (if I may use the term) of cholera and other common swine diseases.

Sure for safe investment, quick returns, the farmer should not ignore swine, or regard them as of secondary importance.

STOCK-FEEDING.

By H. J Waters, Asst. Agriculturist Mo. Ag'l Exp. station, and read at Farmers' Institute.

Complaint comes from all quarters of the State that the selling price of live stock, in common with most other agricultural products, is about equal to, or below, the cost of producing.

The efforts of the different farmers' organizations to correct this unnatural and lamentable condition of the live stock market by legislative measures, etc , is a move in the right direction, yet we should be as deeply interested in any scheme whereby the cost of production could be lessened and the business become once more profitable.

The farmer is not interested in the price his commodity brings, so long as its production yields him a profit.

I shall invite your attention, therefore, to a few ways in which common errors in our methods of feeding may be corrected. We should be always ready to avail ourselves of all information furnished by scientific experiments and the practical experience of feeders that will enable us to make the most profitable use of those materials most easily and cheaply grown on the farm.

That you may the better understand what I shall say concerning food combinations, I will briefly explain a few facts upon which the laws of animal nutrition rest: The health and growth of no animal can be sustained without supplying its system with—

1st. Fat or fatty oils to supply the waste of fatty materials existing in all animal bodies.

2nd. Nitrogenous compounds to supply the waste of the lean portion of the body, or the muscles and cartilages, and to build up this part of the body in growing animals.

3rd. Mineral matters to furnish material for the bones, hair, horns, etc., etc.

There are other groups of elements in feeding stuffs having certain specific functions, but for our purpose these may be omitted. Indeed, we are looking at the subject from a practical standpoint, only interested in the groups forming the lean meat or muscles, or the nitrogenous groups, and that supplying animal heat or fat, or the carbonaceous group.

The nitrogenous, or lean-meat forming group, is by far the most costly, and is supplied chiefly in the concentrated feeds and grains, such as oats, rye, wheat, bran, shipstuff, cotton-seed meal, linseed cake and clover hay. The latter group, or heat and fat-forming group, is found in the coarser foods, such as corn fodder, straw, corn meal or timothy hay.

FOOD COMBINATIONS.

An animal requires a certain quantity of each of these elements to make a pound of growth. The proportion between these groups for economical feeding will vary greatly with product desired. If growth is wanted the amount of muscle-forming elements must be greater than if the animal is to be fattened. Again, a cow in milk or nourishing its unborn young will require a ration much richer in the nitrogenous substances than if running farrow.

The proportion between these two groups is called the nutritive ratio. For example, if a certain food, say corn, furnishes one pound of nitrogenous compounds to every ten pounds of carbonaceous compound, it is said that the nutritive ratio of corn is 1:10.

Now suppose a growing steer required a ration composed of one pound of muscle-making ingredients to every six pounds of a carbonaceous diet for the most economical growth, if he were supplied with only one pound of albuminoids to ten pounds of carbonaceous food, which would be near the case if corn were used alone, there would be an excess of four pounds of carbonaceous elements, This excess would be largely wasted, or would go to the production of excess fat not necessary for the health and growth of the animal. Again, suppose we feed the calf on wheat bran with a nutritive ratio of 1:4, there would be an excess of albuminoids or the most costly part of feed, and to that extent a loss in feeding.

So far, we have assumed that the animal had full feed, or the amount necessary for good growth; suppose, however, he be given enough albuminoids for a maximum growth, but the ration be deficient in the carbonaceous elements, there will not only be a loss of good albuminoids, but an impaired growth to the extent that the fat-forming elements are lacking.

Likewise is it true that if there be given a ration deficient in albuminoids, though there be an adequate supply of fats, there will be a loss of food and a checked growth of the animal. As in other cases, it is the weakest link that measures the strength of the chain.

Now for a practical illustration: Our chief staple crop—corn and fodder—is lacking in the muscle-making elements for the most economical and healthy growth when fed alone, as is the practice; if to this food be added a more nitrogenous food, such as clover hay, a small quantity of wheat bran, cotton seed meal or linseed oil cake, a more perfectly balanced ration is made, and the loss of carbonaceous elements that must follow feeding corn and fodder alone will be obviated.

While speaking of corn fodder, let me emphasize its value in economical feeding. We produce in Missouri, annually, between seven and eight millions of tons of corn fodder, which, at a conservative estimate, is worth three-fourths as much per ton as timothy hay. Rating hay at six dollars per ton would, therefore, give us a yearly value of from thirty to forty million dollars for fodder. That we do not realize this much from it, is clear to every one.

Careful experiments at the Missouri Experiment station have shown that for wintering two-year-old steers, corn fodder, combined with equal weight of clover hay, produced as much growth as timothy hay. I mean that one pound of corn fodder and one pound of clover hay was equal to two pounds of timothy hay. In like manner the prodigious waste of feed in straw may be saved.

PREPARATION OF FEED.

My statements will be brief and based upon experimental data:

1. Cooking or steaming feed is unprofitable.

2. Grinding feed will not pay as a rule, except, possibly, with the dairyman, and then he must be able to make other use of his power at the same time. Unless ground fine, I am certain it does not pay.

3. Chaffing or cutting the coaser foods, such as fodder and hay, or straw, does not pay.

4. Silos have a value with the dairy farmer, probably, but for the ordinary farmer, changes in other directions had best be first made.

SHELTER.

Attention need only be called to this division of my subject to suggest to every farmer present its value in protecting stook, feed and implements.

AGE TO FATTEN.

This brings up the old question of early maturity. In this respect, our farmers know better than they do. I shall be brief and leave details for the discussion. Experiments on this subject are numerous, and point, without exception, to one conclusion: That much feed and money is wasted in feeding too long. An animal may be considered as matured at the earliest moment in its life that it has attained sufficient size to bring the fair average market price. This should not be older than thirty months months for cattle and ten months for hogs.

The cost of a pound of gain increases uniformly and regularly as the animal grows older and larger. This is due to several causes which need not be enumerated. The main cause is that the maintenance ration, or the food of support, increases with the size of the animal, and the total amount of food thus used, of course, increases with each day of life. This fact alone requires that the period an animal is to be maintained be made as short as possible.

To illustrate increased cost of growth Prof. Stewart, of New York, found by carefully weighing the calves and food, that for pound of growth during the first week of experiment eleven pounds of skim milk were required. This amount increased regularly up to the end of the experiment, or, during the ninth week a pound of gain cost seventeen pounds of the same feed.

Again, Vermont Experiment station reports recent experiments with three breeds of hogs, viz: Berkshires, Chester Whites and Yorkshires, as follows:

Period	Av. Wt. of pigs.	Cost of food consumed for one pound gain.
1	62 pounds	2.01
2	96 "	3.07
3	155 "	3.54
4	208 "	4.38

Thus it cost more than twice as much to put a pound on the same hog when weighing 200 pounds as when weighing 62 pounds. This amount increases more rapidly as the hogs become larger, as other experiments show.

The Missouri Experiment station found in experiment with

47	hogs	weighing	under 50	pounds......	cost	for 1	pound gain	3.78	pounds	food.
43	"	"	50-100	"	"	"	"	3.77	"	"
48	"	"	100-150	"	"	"	"	4.18	"	"
41	"	"	150-200	"	"	"	"	4.41	"	"
16	"	"	200-250	"	"	"	"	4.48	"	"
18	"	"	250-300	"	"	"	"	5.70	"	"
6	"	"	300-350	"	"	"	"	6.75	"	"

Or, placing the matter in this way, the average gain per day of all cattle exhibited at the American Fat Stock show during the eight exhibitions 1878-1885:

No. Am. Ex.	Age.	Weight.	Gain per day.
30	297 days—under 1 year..........	780 pounds.	2.63 pounds.
152	612 days—1 and under 2 years..	1334 pounds.	2.18 pounds.
145	943 days—2 and under 3 years..	1639 pounds.	1.74 pounds.
133	1283 days—over 3 years..........	1938 pounds.	1.51 pounds.

These same shows have given us some figures on the cost of this growth that teach an important lesson in this connection. I only give averages:

No. Exhibit.	Age.	Whole cost.	Weight.	Cost per lb.
16	1 year.....	$33 88	829 pounds.	$4 04
10	2 years...........	72 84	1418 pounds.	5 05
3	3 years..........	178 82	2316 pounds.	7 49

Many other tables bearing upon this question could be given.

The length of this paper prevents the discussion of many other equally important divisions of this subject, but, in conclusion, allow me to say that the changes in the present methods of feeding indicated will have a deep and far-reaching influence on our whole system of farming. It will necessitate growing more clover, make rotation of crops more practicable and valuable, increase the amount and value of the manure pile, and many other changes looking to the general good of the farming classes. In short, it is one element of a more intensive and profitable, and less extensive and wasteful, system of agriculture.

FEEDING VALUE OF WHEY.

From Bulletin No 27 of the Wisconsin Agricultural Experiment Station.

Four trials were conducted at this station during the fall and winter of 1890–91, for the purpose of ascertaining the value of sweet whey for pig-feeding. The results of these trials show:

1st. We were not successful in maintaining pigs on whey alone.

2d. Pigs fed on corn meal and shorts with water required 552 lbs. of the mixture for 100 lbs. of gain.

3d. When whey was added to the corn meal and shorts mixture, it produced a marked saving in the amount of grain required for good gains. This was true for mixtures varying from two pounds of whey to one of grain, up to ten pounds of whey to one of grain.

4th. It was found when using whey as a partial substitute for grain, that 760 lbs. of whey effected a saving of 100 lbs. of the corn meal and shorts mixture.

5th. Using these figures, if corn meal and shorts are valued at $12 per ton, then whey is worth 8 cents per hundred pounds; at $15 per ton for the corn meal and shorts, whey would be worth 10 cents per hundred weight.

6th. Shorts, pea meal and oil meal, or like feeds, should be mixed with whey for growing animals. Some corn may be fed at all times, the proportion increasing as the animal approaches maturity.

THE SOIL.

By G. W. WATERS, and read at the Center (Ralls Co.) Farmers' Institute.

The soil is the prime source of sustenance for all forms of life. It is the great repository where the food reserves are stored for all the inhabitants of the earth.

More narrowly and correctly speaking, the soil is the repository of plant-food. Moreover, the soil is the chief source of the wealth of nations, and especially of ours, for the products of the farm, the fruit of the soil, make up over 70 per cent of the money value of our entire exports to foreign countries. Because of farm products and the profits of handling the same, cities are builded and business expands, railroads are constructed, pushing their way beyond the bounds of settlements with a view to the freightage of the yet undeveloped fields. The soil is truly godmother to the teeming populations of earth. To her the children of men must look for food and raiment.

The soil then being so important a factor in human existence and human happiness, there is required no apology to be offered for a consideration of its forces, functions and character; but rather, if apology be needed at all, it is for the fact that the western farmer, as a rule, appears wholly indifferent as to the conservation of its forces and fertility. It is not so much that we do not know what is required in giving the soil proper and rational treatment, but from force of habit and long usage, we are wholly indifferent, many of us, in protecting from damage or loss the great source of our living.

In the older districts and states of our country the question is, "How shall we restore the fertility of our lands?" The question here should be, how shall we prevent the further depletion of ours? for it is much easier to prevent depletion than to restore fertility when lost.

Luckily for us, Nature is very cautious and conservative in her gifts to her children. If one generation were permitted to use up all the plant-food their inclination might lead them to do, and thus exhaust the soil entirely, it would rob the next generation and become a bar to human existence. But Nature has so arranged as to give us timely warning of decreasing fertility, and long before we arrive at total soil exhaustion we reach the point of unprofitable cultivation, and when we have cropped our lands till their fertility has been reduced to a minimum, Dame Nature has cautiously kept back in the great storehouse of the soil plant-food for generations to come. It is this resource, thus kept back inert and unavailable at present, that is the saving clause in the construction of our soils.

The question, then, is how shall we induce our soils to yield their plant-food continuously without losing their power? for I hold that we of this generation have not the right to rob our children of their heritage and entail upon them soils depleted below the point of practicable cultivation.

It seems paradoxical that a soil may have been exhausted as to crop-producing power and yet be rich in plant-food—the elements necessary to plant-growth. The solution is this, that in every soil the larger portions of plant-food therein are inert, unavailable so far as being taken up by plant roots is concerned. They are locked up, so to speak, by Dame Nature. She only allows to be released for our use an annual quota, which is greater or less according to conditions. The questions then for us to consider are two: First, how shall we conduct our farm operations so as to exhaust from our soils the smallest amount of plant-food? and, second, how shall we hasten the development of the inert element of the soil into available plant-food?

These are the pivotal propositions in the conservation of soil fertility and the ultimate basis of successful agriculture.

Our soils contain all the necessary elements of plant-food in varying quantities. A growing crop takes up of this food a greater or less amount, conditioned upon the kind or quantity of crop. If the crop is removed, it is evident that the soil has lost just so much of its fertility as is contained in the crop. This removal, if repeated year after year, results in depletion. But different crops use different proportions of the several elements, and the exhaustion would be less apparent, nor indeed so great, if a variety of crops were grown. But this phase of the question belongs properly to the subject to be treated by others—"Rotation of Crops."

Now it is apparent that if the removal of a crop from the land reduces its fertility by just so much as the amounts taken up by the growth of such plants, and there is no other source whence we may obtain this lost fertility, then with mathematical certainty agriculture must decline. But we are sure in the light of science, experience and observation, that we may increase our yields of crops and at the same time increase the fertility of our soils, all within the resources of the farm. If this can be done, it solves the problem and removes the forebodings of ultimately worn-out lands.

Nature has chosen to so arrange plants that are food for man, that the parts of the plant best suited to his use are least suited for plant-food. For instance, in growing a crop of wheat of 30 bushels, the soil yields 144 pounds of mineral matter. The essential part for food, the 1,400 pounds of flour, contains only 10 pounds of the mineral matter, leaving 134 pounds that may be largely returned to the soil by judicious management. In a corn crop a similar condition occurs, the grain containing only 8 per cent of the entire plant-food required of the soil in producing the crop.

Again, nearly the same ratio obtains in feeding animals. There is stored up in the carcass of the animal only about 10 per cent of the essential plant-food that may have been used in maintaining or maturing the same. From these data we discover the vast difference that exists between a conservative and a wasteful method of soil management. In the one case the soil is robbed to the entire extent of the full amount taken from it by the growing crop; in the other case, only one-tenth as great a loss is sustained. Hence, we arrive at the oft-repeated counsel to the farmer, to sell only concentrated products of the farm in the form of beef, pork, wool, butter, cheese, etc., and return to the soil whence it came all the refuse. The loss sustained by the soil would thus be reduced to a minimum. But there would be an evident loss, and the proposition we set out with, that we can by proper management improve both the yield and fertility of the soil, all within the resources of the land itself, remains unproven. Whence shall come this evident loss?

As indicated before, Nature has locked up in the soil a store of plant-food, and only yields a portion of this annually to the use of the crops. She declares limited dividends, evidently intending that her stores shall not be exhausted at once by the greedy husbandman.

These sources of plant-food that are slowly becoming available under natural conditions, may become more rapidly so under artificial conditions. The chief means of soil development is cultivation, which, in this case, simply means the exposure of the particles of soil containing inert plant-food to the oxidizing and disintegrating influences of air and sunlight, and by judicious cultivation, together with the intelligent rotation, a greater development of soil fertility is obtained than is necessarily lost in such crop management as indicated above.

We have thus far only considered the plant-food inherently belonging to the soil itself. It is confidently asserted by some investigators, that one of the prime elements of plant-food is obtained from the air. It seems reasonable that it should be so, for when we consider that one of the most essential plant-foods, especially in the production of seeds and grains, is nitrogen, and the one most difficult to obtain, costing 17c to 20c a pound when bought in commercial fertilizers, and then consider that all plants are surrounded and covered with boundless quantities of nitrogen, it seems strange that they should suffer and make a stunted growth for want of it. It is like the ship-wrecked mariner, dying of thirst, with water, water everywhere and not a drop to drink. It occurs to me that in this age of wonderful discovery, that some patient chemist may work out in his laboratory a method of rendering the nitrogen* of the air available as "potential plant-food." But the farmer cannot wait for the scientist, but must use the means ready at hand to prevent soil depletion, grappling with conditions as they now exist.

The value of the plant-foods of our soils may be appreciated by a comparison of what they would cost if we had to buy them in the open market. To illustrate, the soil yields in producing a bushel of corn (including the entire plant), of nitrogen, 1.28 pounds; phosphoric acid, .60 pounds; potash, 1.50 pounds, which, at the quotations of fertilizers to-day, equals 38c. The plant-foods stored in an acre of fairly good land would cost, if they had to be purchased, as follows:

8,000 pounds of potash at 4 cents	$32 00
4,000 pounds of nitrogen at 17 cents	68 00
2,000 pounds of phosphoric acid at 10 cents	20 00

Or a total of $120 for these three ingredients alone, with eleven others to be supplied. These calculations give us an idea of the valuable work done in the laboratories of nature during the ages of the past. Does it not behoove us to carefully guard the rich stores of our fertile soils? In view of what has been said, it remains only to suggest practical methods of returning to the soil everything and every part of the crops raised not actually stored up in the concentrated products of the farm. The nearer we come to this, the nearer we come to a perfect conservation of the soil's fertility. Cultivation and rotation are the two other factors, and these subjects are treated by others.

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* The weight of air is 15 pounds to the square inch of surface; 76 per cent of this is nitrogen. The value of a commercial fertilizer depends on the quantity of nitrogen, phosphoric acid and potash it contains—their values being relatively, nitrogen, 17c.; phosphoric acid, 9c.; potash, 4c.

CLOVER FOR PROFIT AND AS A FERTILIZER.

An address by W. R. McILVAIN, of Lebanon, Mo., before the Farmers' Institute of Missouri.

The Farmers' Institute of this (Laclede) county have requested me to write an article on the heading of this paper, and in asking your attention for a short time on this subject, I do not want to appear as a specialist. A great many pages have been written from time to time on this subject, and it would require the talents of a genius to produce an article entirely new in every detail. I will offer the following ideas or points, some of which are original, and some have been taken from the opinions of others.

There are in the United States forty species of native clover, and none of the native species has been cultivated so far as I know, though several of them are of as large and vigorous growth as the common red clover, the variety I intend this paper to apply to, and certainly should be tested by our experimental stations, as they may prove better adapted to some of our soils than that species. As regards the Mammoth, I do not like it—do not sow it—for this reason: if sown on fairly productive lands it will grow so tall or rank that it will fall and the grass next to the ground will sour and mold, and consequently will be unfit for hay.

I would advise all to be careful in the selection of their seed, and buy it as free from all foreign substances as possible, even if you have to pay more for it.

At a session of the National Agricultural Society of the United States, Dr. A. R. LeDoux, the director of the North Carolina Agricultural station, stated that the average per cent of pure seeds was 59. Of the 59 per cent of seeds which were what they were represented to be, only 18 per cent was capable of germinating, and in reporting on clover seed, he stated that in Bohemia and elsewhere, large factories for the manufacture of seeds from quartz were running, with warehouses at Hamburg and other commercial centers. The quartz grains, colored to order, were selling at $50 per ton, and were largely used to adulterate clover. An ordinary observer or buyer will never detect the fraud, even when the sample is adulterated 25 per cent with these stones. So, if the average per cent of pure seed was 59, the remainder, or 41 per cent, was of foreign substance, and a part of this 41 per cent were seeds of different weeds. And during the summer or after harvest you will see inquiries in all the agricultural papers to this purport: a new weed has appeared in our fields or meadows; threatens to kill out everything else; what is it? where did it come from? and a truthful and plain answer would be: you bought it with your seed.

I remember very distinctly of sowing a ten-acre field, fifteen years ago, with clover, as I supposed, but instead of clover it was clover and plantain—a seed that looks very much like clover, and one of the greatest nuisances that ever rooted on a farm.

I know that there is an objection on the part of some to raising clover because it winter-kills, and by others, that it is a difficult crop to save for winter food. Now in the first place, it must be understood that clover is a biennial plant, and in the second place, that in this section of the United States, the first crop does yield seed. I know that in Ohio and farther east this is not the case; and I claim that the hue and cry about winter killing is not altogether just. Some, when they sow clover, will mow and then pasture the field, and not give the clover a chance to blossom and the head to fill with seed, so that it might re-seed the ground; and by so doing the clover is exterminated (it being biennial, as I stated), and the cry next year is that it winter-killed. Of course I do not contend that the winter or the freezing and thawing will not kill it, but I do claim that if the ground is not wet or spouty, only a small part will die from this cause. But rest assured of this, that it is as poor farming to sow wheat on wet or spouty lands as it is to sow clover.

Now as to the time of sowing? This is a pretty hard question to answer, as the young plant will have all the elements to contend with. One year it might be better to sow in the fall, and another year in the spring. As a general rule, I would recommend sowing early in the spring for this section of the State, say the latter part of February. One of the nicest times is to sow on a snow, as you can track your land with footprints in the snow. When I speak of sowing in the spring, I take it for granted that the land has been seeded to wheat or rye in the fall previous, or in oats. If sown on oats, you will have a fresher and better prepared seed-bed, as the ground will have been plowed only a short time, or even if plowed the preceding fall, it will be stirred when the oats are sown, and it is patent to all that clover is no exception to other seeds as regards the advantage of having a fine and well-prepared seed-bed, while if sown on wheat or rye in the spring, the surface will be more compact and even, and the seeds will have to grow on the top of the soil. As far as my experience goes, the surest plan to get a good catch or stand is to sow the seed when you plow your corn the last time. The corn plow will leave the surface uneven, but this will be no disadvantage to the seed, and the corn will protect it from the hot sun. When I speak of sowing on corn ground I take it for granted that the corn will not be hilled by a turning plow, as was the custom in our grandfathers' day, but that it has been cultivated somewhat on the even culture system, which has proved to be the best by tests made at our experimental stations. Four or five quarts of seed will be enough to sow per acre, if it grows properly.

THE PROPER TIME TO CUT HAY.

Hay is nothing more nor less than grass in a dried state, containing all of those ingredients that are essential to the sustenance and growth of the animal tissue, and the value of any article of food is measured by the per cent of albuminoids or flesh-producing material it contains.

Having given a simple definition of hay, the purpose for which it is used, and the test by which its value is determined, I will state that science has explained why the very best hay is cut just before it is in full blossom: because at this stage of its growth the young, succulent grass contains more of the albuminoids, and less of the crude indigestible matter than at any other period of its existence, and as it grows older, the percentage of albuminoids rapidly decreases, while the crude and indigestible fiber constantly increases.

In proof of this statement I will give the results of Dr. Wagner's experiment made at Darmstadt: He selected a field of red clover of uniform growth and divided it in three equal parts, each of which contained eight and one-fourth rods. On May 22, just before the clover began to blossom, plat No. 1 was cut, yielding 85 pounds of cured hay. June 13, plat No. 2, when in full bloom, was cut, yielding 114 pounds of dried hay. July 1, near the end of blooming, plat No. 3 was cut, and yielded 128 pounds of dried hay. You will see that in the 40 days intervening between the first and last cuttings, there was a gain of 43 pounds of hay, or at the rate of 800 pounds to the acre.

Now I know you are ready to say that this is a bad showing for early cutting, and so it is if weight is the object. But did the increase of feeding value correspond to the gain in weight? To settle the relative value of these three lots of hay, Dr. Wagner subjected them to chemical analysis, and found the 85 pounds cut from the first plat contained 64.2 pounds of organic matter, 11.8 of albuminoids, 21.9 of crude fiber, and 30.6 of carbo-hydrates or fat-producing material.

The 114 pounds from plat No. 2 contained 90.5 of organic substance, 11-2 of albuminoids, 36.4 of crude fiber, and 41.9 carbo-hydrates.

The 128 pounds cut when the blossom had turned brown contained 100.2 pounds of organic matter, 12.8 of albuminoids, 42.8 of crude fiber, and 46.9 of carbo-hydrates. If the relative amount of albuminoids any given feed contains determines its feeding value, we will find the first hay cut will stand at the head of the list. It is true, during the forty days intervening between the first and last cutting, there was a gain of 36 pounds of organic matter, but it gained only one pound of albuminoids, while the crude, indigestible matter is increased 21 pounds, or nearly double; and you will also notice that from the full bloom to the brown heads there was hardly any gain in albuminoids, but the crude fiber increased 6¼ pounds, and the carbo-hydrate 5 pounds.

But another fact must not be lost sight of in estimating the value of the 43 pounds gained in the 40 days, which is, that fully one-fourth of this gain is indigestible, and will be thrown off as effete matter, and if the grass was allowed to stand until entirely ripe, one-half will become worthless as nourishment, while on the other hand, the early cut clover is almost as digestible as meal and potatoes. Now, 30 pounds of the first cut hay, 37 of the second, and 40 of the third or last cutting, are equal; or, in other words, if hay cut before blooming is worth $20 per ton, that which is not cut until the seed is nearly ripe is worth but $15 per ton. If the hay is for market, and the purchaser is ignorant of the intrinsic value of hay, the riper the better for the producer, because he can sell more woody matter. And in Dr. Wagner's comparison of clover with timothy, as to their flesh-producing materials, clover stands to the fat and heat generating matter as 1 to 2.16 while in timothy hay the same components are related as 1 to 4. Nature should be studied in her methods and efforts to fertilize the soil. The tendency of all soil is to produce vegetation. If the seeds of forest trees are scattered upon soil congenial, they will grow, and as the leaves fall and are left upon the surtace, they mulch the land, keeping it moist, and each succeeding year will give increased strength to such soil, not only from the decay of leaves, but the mulching keeps the soil moist, and thus enables the soil to take up the ammonia from the decaying leaves. Hence, the importance of preventing the forest fires from running and burning the leaves and leaving the land bare.

The roughest and poorest soils we have possess a certain natural capacity, and by proper tillage and the proper application of manures can be made to produce good crops, and yet, the strongest may be brought down to a point where production is unremunerative. In all new and thinly settled timber countries, the custom prevails to follow the clearing by constant plowing, year after year, until the virgin soil is exhausted, and then clear more land. Our section is no exception to the general rule, and the question is, what shall we do about it? What is the remedy? What would be the natural way or Nature's way to restore worn-out soils? By sowing seeds, whereby millions of rootlets would penetrate deep in the earth, and bring forth the potash, the lime, the sulphur, the phosphorus and other chemicals, which combined with the carbon and nitrogen of the air, promote the growth and sustain the life of the trees or plant there found, and to place over it a perfect and complete shelter for the double purpose of protecting it from the burning rays of the sun, and for supplying that wonderful laboratory by which the nitrogen of the air is converted into woody matter.

Nature protects the soil from the burning rays of the sun by an impervious shade. Nature, by shade, by roots, by dead branches, by rocks and by leaves throws obstruction in the way of evaporation and washings. Man, by removing the shade and verdure, promotes evaporation and wash, and by continued plowing, and especially shallow plowing, puts it in the best possible condition for washing off the soil. Nature, through the millions of deep-searching roots and earth-worms of various kinds, provides for a free circulation of the air to great depths, and thoroughly intermixes, pulverizes and mellows both the soil and the subsoil.

Man disturbs only to the depth he plows, leaving the subsoil compact, and by constant cropping and taking off, and failing to add anything, exhausts these supplies of plant food which nature has been storing for ages.

Farmers are fast learning that there is a law of compensation in the replacement of plant foods that the crops have consumed that must be observed, and the more liberal the compensation the richer the returns, and the more profitable the investment. All methods of manuring are merely modes of compensating the soil for the crop that has been removed, and all who fail to manure are robbing the soil, and will soon find that all the fruits and benefits of labor are vanishing in proportion as he robs the soil.

There is no better method of manuring than the sowing of clover, and especially when a crop is plowed under. There is no doubt whatever but that the deep, searching roots of clover will act to a certain extent as an underground drainage; often the roots will penetrate and go through a stratum of clay, and after the root has decayed the water will follow the opening made by the root, and drain the surface to a certain extent.

Prof. Atwater, in an article on the "Extent and Depth of Roots," says: "I have some roots of timothy, clover and other plants, dug up from a very heavy clay (a good quality of brick clay), so compact and hard that a sharp knife, in cutting it, leaves a surface as smooth and shiny as it would cut on the end of a pine board. I have traced the roots of timothy to a depth of two feet four inches, and the clover three feet and two inches, in it."

Prof. Johnson, in "How Crops Grow," says that Shubert, in his experiments, found the roots of clover, one year old, were three and one-half feet long, and those of two years old but four inches longer.

Prof. Stockbridge washed out a root of common red clover, one year old, and found that it extended perpendicularly to a depth of eigth feet. These experiments were made by directing a stream of water against the vertical walls of the soil, until the soil was washed away, so that the roots of the clover growing in it were laid bare.

According to the statistics of Ohio for the year 1879, I find that in the county of Tuscarawas, my former home, there were 20,518 acres of which made 21,083 tons of hay (a part of this acreage was pastured), and they raised 14,712 bushels of clover seed; 1,079 acres of clover were plowed under. In that year the price of hay and seed was $5 each. The hay was valued at $102,592.50, and the seed at $73,562.50, making in all $176,155, or an average of $8.60 per acre.

Clover seed is one of the most profitable crops we can raise, and the least exhausting. It is a necessity for seed, and the purpose to sell. It has been said, "that if a person was preaching the gospel of agriculture, he might well hold up the triple leaf of the red clover as a symbol of a trinity of blessing to the farmer, furnishing for his cereal crop from otherwise inadequate sources a sufficient supply of potassium, phosphorus and nitrogen;" and if I were designing an emblematic seal of our national agriculture, I would make the central figure a clover leaf.

ROTATION OF CROPS.

BY COL. M. B. W. HARMAN, PICKERING, MO.

Late improvements in steam navigation practically make ferries of the ocean. A single vessel will carry several hundred bullocks from New York to Liverpool, and a ship laden with frozen meat, either from South America or Australia, will reach the same point in much less time than it required fifty years ago to drive a hundred bullocks from Ohio to Philadelphia. The same remarkable annihilation of time and distance attends the movement of all the products of the farm and ranch to points promising the most remunerative returns.

On the European side of the Atlantic ferry, land sells from $20 to $500 per acre, on our side from $1 to $75 per acre. That the price of our land must advance seems almost inevitable, and the price of our farm products must advance with the price of the land on which they are produced, unless the cost of production can be lowered. The cost of all kinds of manufactures has been rapidly lessened through the inventive genius and applied science of our people. The influence of the church, school, press and stage has been vastly promoted by the quickening influences of the age, and it is not surprising that farming is touching elbows in the progressive march with all the elements of progress.

It is not enough that the Missouri farmer of to-day is better fed, housed, clad and educated than the farmer of any other nation or country, or that he is in the enjoyment of more of the comforts and luxuries of life, or that better stock, tools, tillage and methods are fully appreciated and utilized by him; he is still confronted with the fact that cheap transportation places him in direct competition with the products of the cheap labor of other countries in the markets of the world, and that his ability to even in this rate of competition must depend on his ability to adapt and utilize all the elements that tend to cheapen the cost of producing the products of the farm; and in no way is this easier accomplished than by a judicious system of rotation of crops, in which red clover is an important factor. It conserves the fertility of the soil, it frees it from noxious weeds, it prevents the increase of destructive insects, it extends the labor throughout the year, it diversifies the farm product, it gives more time for careful handling of each product, and consequently an increased yield per acre at a less cost per bushel or pound. Following a broad with a narrow-leaved crop utilizes both the upper and lower strata of the soil; the soil is kept full of grass-roots whose decay loosens and lightens the soil, and consequently makes improved tillage easier, quicker and better, less laborious and more productive.

Intensive farming, based upon a proper rotation of crops, is the "Archimedean" lever that will raise the profits of the farm to a remunerative basis, by lowering the cost of production, even in this era of cheap transportation and low prices.

SOME MISTAKES OF FARMERS.

Read at the Sullivan County Farmers' Institute.

POLLOCK, MO., Oct. 13, 1890.

CHAS. B. COMSTOCK, Esq., Green City, Mo.:

MY DEAR SIR—I was invited by the Secretary of the State Board of Agriculture to be present at a meeting to be held at your place on the 15th inst., but as I cannot be on account of other business, I write you and beg that you will present my regrets to the members of the Board there present, and assure them of my willingness to do all I can to advance the farmer's interest. It is evident that the farmer has a hard row to hoe, and if we could possibly learn through an interchange of ideas and experiences to make our labor more profitable, much good would accrue. Permit me to say that in my twenty-five years' experience in farming in Sullivan county, I have learned to believe that we have here a grand and good location for our calling, and I note that in the last ten years we have made much improvement in our methods of farming. My experience teaches me that as a rule we have been overreaching ourselves, doing too much all in the wrong direction. Some farmers own so much land that they cannot make it all profitable. This is evidenced by some pastures, the half of which are so densely covered with brush that a great loss is sustained on that account. Again, some plant double the area in corn that they can properly cultivate, and harvest one-fourth of a crop from the land. The loss in this case is easily calculated. Often you may find a case where there are double the number of cattle for which there is pasture on the farm. When cattle are thus grown to maturity and marketed, the sum realized will be about half what the correct number that should have been grown would have brought. On many farms this condition will be found to run through the whole catalogue. We attempt double what we should, we give it half the attention it should receive, and we reap no profit from the venture. But we are improving in our methods. We have much to learn, but we are beginning to learn fast, and I trust and believe that by the end of ten years more the condition of the farmers of Sullivan county will be equal to that of those of any section of our common country. In the hope that we will all learn to make two blades of grass grow where one formerly grew, I subscribe myself,

Very respectfully yours,

JOHN C. SCHNELLE.

CARE OF RIPE GRAIN.

The following paper was prepared for the Franklin county Farmers' Institute by H. M. Fugel, a farmer and miller of Beemont:

GENTLEMEN—By request I have prepared a paper on "The care of grain when about ready for the scythe." In the first place, wheat should be well ripened before it is harvested, for two reasons: first, wheat thoroughly ripe will keep in the stack in wet weather about twice as long as that cut too early; and second, it will make much better flour. It will look a little shrunken, but in the manufacture of flour the separation is much easier, the bran will flake off and not be cut up fine enough to sift, and the flour be much whiter. The berry of wheat cut early may look a little smoother, but the dough from the flour will not rise so well, and when it does rise must be baked in a quick oven or the bread will fall.

I would advise every farmer to let his wheat get very ripe; it will not get too ripe, and the little loss from shattering will be more than compensated by the improved quality of the flour.

After wheat has been stacked it should stay there until it has gone through a sweat, which it must undoubtedly do, it makes no difference whether it be in the straw, the bin or in the ground flour in the barrel; so my advice would be to let it go through the sweat in the straw. After threshing, the wheat should be put in a granary built for that purpose, at least two feet above the ground, set on wooden or stone blocks, stone preferred, and then keep the weeds down so the air can pass under and around it freely.

Where weeds or grass are allowed to grow round a house where wheat is kept, it will cause it to grow musty and sometimes rotten and unfit for market. The farmer who has that kind of wheat loses from five to ten cents per bushel, which is very heavy interest.

There could be a great deal more said, but I will leave it for others.

THE AGRICULTURAL DEPARTMENT.

By A. S. SMITH, Secretary of State Grange, read before the Farmers' Institute of Ralls county, Mo.

Mr. President and Gentlemen of the Board:

At the kindly and urgent solicitation of gentlemen prominently connected with the present Institute, I have been induced to endeavor to present something that might be of general interest to those in attendance to-day. Circumstances have placed only the briefest time at my command, hence that which I shall say will be limited to a generalization rather than to the treatment of a special topic. Between the time of my notification of your meeting at this place, and the present, I have been in attendance at the 19th annual session of our State Grange, and as the Secretary's work was mainly performed by me, I have had but a day in which to prepare for the meeting. But subjects of special science embraced within the general range of topics treated by those participating in your meetings are usually best treated by them, because the gentlemen thus acting have nearly always made them special themes of study. Upon the majority of these important subjects, I must plead that lack of practical experience that would fit me for discussing them with any degree of assurance. Indeed it is the many useful and highly important truths connected with agriculture and its kindred branches that signalize these Institutes and establishes unto the farmer—not alone of this State, but of every other State—the value of our Agricultural colleges and Experiment stations. These institutions, as well as all appropriations of similar import, have been met with the usual historical opposition and bigotry, but the stubborn character of that opposition has been broken, and henceforth, it is safe to predict, the Goddess of Agriculture will meet with small obstacles in the diffusion of her truths. When we enter into a comparison of the great interest of agriculture with that of other interests, the maintenance and fostering care that should be extended to it becomes apparent. It is the basis of every public and private enterprise, and donates, either by voluntary or enforced tribute, to the prosperity of every other industry.

It employs, directly and indirectly, seventy per cent of all labor; it furnishes eighty-five per cent of inland commerce, and eighty to eighty-three per cent of all exports; it pays seventy per cent of direct and eighty per cent of indirect taxes.

When we note the fact that the prevailing tendency of legislation is discriminative against agriculture and in favor of other callings, with an increasing army of non-producers, then indeed it behooves us to embrace every means of increasing the food supply of the world, with the smallest outlay of capital, labor and area of soil cultivated. In this relation, Gov. Jno. S. Marmaduke, in his message to the 34th General Assembly of the State, speaking conjointly of the Board of Agriculture and Fish Commission, has this to say:

BOARD OF AGRICULTURE AND FISH COMMISSION.

These two boards have to do with our food supply. They both serve the State without emolument, and both are rendering excellent and important service. I do not understand that the object in their organization and their labors is to ascertain how and then instruct our farmers and other agriculturists how to merely make money by raising hogs or cattle or fish or corn or wheat or any of the infinite variety of the products of our land and waters, but that it is their business to first ascertain how and then instruct our people how to economically increase the supply of all kinds of food, in order that our large and rapidly increasing population may have plenty to eat. This is a matter every one is interested in, and as these boards are doing good work in that direction, I hope you will grant them sufficient money to meet all proper expenses incurred in their useful and gratuitous labors.

Doubtless, one of the greatest evidences that has been afforded of the more general recognition of the importance of agriculture is that of making the Department of Agriculture a cabinet office.

Hon. Henry L. Muldrow, of Mississippi, during a debate in the House of Representatives, in May, 1882, declared that "if I have a hobby it is the creation of a Department of Agriculture, with a cabinet minister at its head. At the first session of the 45th Congress I offered the first bill, the object of which was to elevate this Department (agriculture), and make its chief an executive officer, with a right to a place in the cabinet of the President. The measure was criticised by some and ridiculed by others. The New York Tribune asserted that it emanated from a member who hailed from a state where shot-guns were the principal implement of husbandry, but I am glad to know that it had the effect of drawing attention to this subject, and was supported by some of the best men and leading journals of the country."

Mr. Muldrow, in subsequent Congresses during his public service, renewed this measure and ably supported its passage. Other bills for the enlargement of the powers and duties of this department, were also introduced or supported by members in both houses—In the Senate, by Messrs. Miller of New York, Jones of Arkansas, George of Mississippi and Windom of Minnesota; in the House, by Messrs. Aiken, Hatch, Anderson, Updegraff and others.

The arguments introduced in behalf of the measure were interesting and exhausted all history. They were such as these: Every government in Europe had an Agricultural department fostered and protected by the State. Even Mexico and the South and Central American republics had such departments, etc., etc.

With regard to the Department of Agriculture, some facts as to its history may not be out of place.

It is now in the twenty-ninth year of its existence as a distinct branch of the operations of the Government. Previous to its establishment, for many years the agricultural interests of the country received the attention of the Government, to a limited extent only, through the Patent office. In May, 1862, Congress responded to a general desire of the people, by the passage of an act establishing the Department of Agriculture. The general designs and duties of the Department as defined by this act are: "to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture, in the most general and comprehensive sense of that word, and to procure, propagate and distribute among the people new and valuable seeds and plants."

The requirements made of the Commissioner in detail would be too lengthy for this article. He is required by the act to employ chemists, botanists, entomologists and other persons skilled in the natural sciences pertaining to agriculture. The working force is systematically arranged in divisions, each one of which is directed by a responsible head. These divisions are the Seed division, the Entomological division, the Statistical division, the Horticultural, Pomological and Propagating division, the Chemical division, the Botanical division, the Microscopical division, the Forestry division and the Veterinary division. Through these divisions the Commissioner is enabled to execute the various duties prescribed and contemplated in the organic act creating the Department, as approved May 15, 1862.

The benefits accruing from a distribution of seeds alone are incalculable. This portion of the work of the Department, particularly as conducted through the medium of representatives in Congress, was at one time the butt of much unfounded ridicule from many know-all farmers and much of the partisan political press.

To enumerate some of the advantages obtained through a distribution and change of seed will not be out of place in this paper.

The records of the Department show that where the wheat crop, from an average of 24 bushels per acre has gradually diminished to 20 bushels or less per acre, a change of seed again ran the crop up to its former maximum average, indicating that a diminishing production is not always attributable to soil deterioration alone, and that a systematic rotation of seed exchange is a potent factor in maintaining the productive capacity of the soil. Some of our cereal crops are grown in climates which are not the best fitted for their full development, and such seeds will perpetuate a weak progeny.

Mr. Wm. G. Saunders, from whose authority these facts about the Department are obtained, says in this regard: The oat may be cited as an example; this plant requires a somewhat moist and cool temperature for perfect development. In North Britain and other northern

European countries, the average weight of a bushel of oats may be placed at 44 pounds, although crops weighing 48 and 50 pounds are not unknown.

About the year 1870, the Department imported and distributed 300 bushels of oats which weighed 51 pounds per bushel. The yield from these averaged, the first year, a crop of 65 bushels per acre, and a weight of 46 pounds per bushel. The second crop showed a slight falling off in quantity, and the weight decreased to 40 pounds per bushel.

It would be impossible in a short article to name all of the advantages of the Department in their detailed application, but a few of them may be briefly named.

One important object is that of quickly testing the merits of new seeds in untried localities and on wider and more varying areas. By the word "new" is meant the seeds new to their place of introduction. For example, Alfalfa or Lucerne is new to many places, and yet it has been cultivated for over 2,000 years; it has been frequently mentioned as a new plant and a valuable one in many of the Western States, where it is popular as a forage plant.

As a sample of returns, Mr. Saunders refers to the Fultz wheat. He says: This variety was first distributed in 1871, with the following results:

From Virginia, from 40 experiments in nearly as many counties, the lowest reported yield is 15 bushels to the acre, the average being 30 bushels; several yields of 40 bushels were reported, and one of 66 bushels per acre. In Burke county, N. C., yield 30 bushels per acre, weighing 65 pounds per bushel.

From nine counties in Kentucky rated yields were from 26 to 48 bushels per acre; weight usually above 60 pounds per bushel, and reaching 65 pounds.

A farmer of Pulaski county, speaking of his crop of 48 bushels per acre, says: "Land adjoining that on which this was grown made 20 bushels per acre of our commonly sown red wheat."

A yield of 24 bushels per acre is reported from Gloucester, N. J., and of 32 bushels in Salem. In the latter case Delaware red wheat in the same field returned 11 bushels per acre. Wisconsin reported yields of 30 and 32 bushels per acre, weighing respectively 65 and 63 pounds per bushel. Frederick county, Md., reports a yield of 42 bushels per acre on 42 acres. In Vinton county, Ohio, 8 bushels sown yielded 139 bushels, weighing 64 pounds per bushel, the increase of two quarts in three years. In Benton county, Minn., this wheat yielded 42 bushels to the acre. But we have varieties of wheat now that are out-yielding the above, and which are an illustration of the advantages of a ready distribution of new seeds and the stimulation it affords to our own propagators in their endeavors to introduce new and improved varieties.

The annual loss to farmers and fruit-growers from the depredations of noxious insects is not less than $3,000,000. With this the Entomological division has to deal. Almost every year brings into some locality a new pest of the insect species. More than 300,000 species are already known, and many yet remain to be described.

No estimate can be placed on the value of discoveries made by the experts of this division for combating these wealth-destroying pests. But the minuitæ of this great department of our government is too vast and varied for any paper to be read before this body; even moderate justice to its immense work is well-nigh impossibe.

The above matter is not introduced as an argument for the department and similar institutions, but to give some idea of what it is accomplishing. It is the mission of our Agricultural college, Experiment station and Board of Agriculture to accomplish for the State what the Department of Agriculture is accomplishing for the nation.

The agricultural resources of our great State have not yet been estimated, but however great those resources may be, they do not warrant a lavish and extravagant drain upon them, but demand a careful, intelligent and thoughtful application of the principles of agricultural science, for the time must come when every available inch of our land territory must be utilized in a productive sense.

In thirty years the crop increase of the country was, from 1850 to 1880: Wheat, 100,488,994 bushels to 459,483,137 bushels; corn, 592,071,104 to 1,754,591,576 bushels; and cotton 2,469,093 to 6,539,021 bales.

The estimates for 1885 were: Wheat, 376,000,000 bushels; corn, 2,000,000,000 bushels, and cotton 6,000,000 bales—these three alone aggregating in value $1,132,000,000.

It is hardly within the province of this article, but I cannot refrain from calling attention to the fact of how startlingly little of this vast sum has been left in the hands of the producer, as evinced by universal complaint, and his comparatively small advancement in surrounding himself with the evidences of wealth.

Daniel Webster said: "The freest government cannot long endure where the tendency of the law is to create a rapid accumulation of property in the hands of the few and to render the masses of the people poorer."

In 1882 the danger was pointed out that eleven men in the United States claimed over $700,000,000, upon which interest was demanded and collected. It is sufficient to know that these eleven men were none of them agriculturists. But it is quite clear that the farmers of the nation have to pay tribute to these men, because the farmer is not alone the chief producer, but the chief consumer as well. Placing the interest on this vast sum at the low rate of six per cent, it would require 560,000 steers, weighing 1,500 pounds each, at 5 cents per pound, or $75 per head; or 2,626,000 hogs, each weighing 200 pounds, at 8 cents per pound, or $16 per head; or 42,000,000 bushels of wheat at $1 per bushel; or 84,000,000 bushels of corn at 50 cents per bushel; or the labor of 115,000 men for every day in the year, at $1 per day over and above the cost of board, clothing and tools, to pay the same to these eleven millionaires. This wealth accumulation has probably quadrupled since that time, while that of the farmer, although he is making scientific advancement, is falling behind. Then if legislation is to be against the farmer's interests, the need of knowing how to make "every edge cut" grows all the stronger, and certainly, the more intelligent he grows the less liability will there be of his enslavement.

In conclusion, and in the line of statistical matter which I have been presenting, I would call attention to the following published a year or more ago. We may safely conclude, that in the interim there has not been much if any diminution in the estimate found below. The census lately taken will probably reveal with greater accuracy the real number and amount of farm mortgages and like encumbrances:

MORTGAGES ON OUR FARMS.

The amount represented by the faces of the farm mortgages in Ohio, Indiana, Illinois, Wisconsin, Michigan, Minnesota, Iowa, Nebraska, Kansas and Missouri, are:

Ohio	$701,000,000
Indiana	297,000,000
Illinois	620,000,000
Wisconsin	250,000,000
Michigan	350,000,000
Minnesota	175,000,000
Iowa	351,000,000
Nebraska	140,000,000
Kansas	211,000,000
Missouri	237,000,000
Total	$3,422,000,000

The actual value of the farms lying in the ten states is to-day about $18,000,000,000.—New York times.

This does not include national, state, county or individual debts. The proportion of the national debt to the ten states will be near $700,000,000; then add to this state, county and individual debts, will amount to, as far as estimate has been made, to $9,650,000,000. It cannot be doubted that a proper financial legislation is one of our paramount needs, but one of the steps to secure it is a proper education. To this we are rapidly advancing.

LEGISLATION PERTINENT TO AGRICULTURE.

[By THOMAS DAY, Lewis Station, Missouri, Chairman State Ex. committee F. & L. U., and read at the Henry County Farmers' Institute.]

MR. PRESIDENT, LADIES AND GENTLEMEN OF THE INSTITUTE—In assigning the subject of "Legislation pertinent to the State Board of Agriculture," your Secretary was the victim of misplaced confidence in the matter of selecting a respondent. But with him I fully agree in this, that the farmers of our great agricultural State are in comparative ignorance of the duties and the importance of the position occupied by the State Board of Agriculture. Its functions may be stated by saying it was created for the purpose of a general supervision of the educational interests of agriculture, which very properly includes horticulture, stock-raising, and, in fact, every production of the surface of the earth.

By education is not meant the simple mastery of the text-books of our schools and colleges, but that broad intelligence acquired by men and women from day to day, week to week, month to month, by experiment and research, by comparison of methods, and the diffusion of acquired information, and, if you please, by just such schools or institutes as the present. Not many years ago, a very common expression among farmers was one of contempt for "book-farming." That idea has passed away along with many others, and has given place to the other extreme, viz.: the better the laborer in any branch of agriculture is equipped with book-knowledge, other things being equal, the easier and more certain is ultimate success. Every one at this time in this progressive age is applying "book-farming," however little he may be willing to acknowledge it, if he is following the profession of agriculture.

The State Board of Agriculture occupies the same relation practically toward agriculture that the department of education, with the State Superintendent at its head, does toward the public schools, and is just as clearly needed, as men and women are simply grown-up children, and stand in need of information in their particular avocations as much as the youth of the land in mental training. This position being agreed to, it follows that the nearer universal is the diffusion of the needed information relative to our profession, the better for all concerned; and I take it, every citizen of our land is particularly concerned in the success of agriculture, and any talk about class legislation in this connection is a play upon words and not applicable. For so long as the tiller of the soil prospers, all other classes prosper, and when the agriculturist meets with widespread reverses and suffers, then economy and stagnation is noted in the arteries of trade and commerce.

Our servants, the General Government, long since recognized the importance of our welfare, by their constantly increasing annual appropriations to be distributed among the several States in the interest of agriculture, amounting, as it did in 1889, to $1,715,826, besides the large bequests of public lands made in 1862, from the proceeds of which we have in this State $312,000; but strangely enough, the State Board, the nominal head of our agricultural interests, does not receive any benefit from this munificence, and I may almost say, neither does the agricultural class. It would lengthen this paper too much to enter into a detail of this misappropriation of funds, or I would better say turning it aside from the original intention of the bequest, and we might be accused of opposition to education, which is very far from our intention, but we simply say (to use a homely expression) let each tub stand on its own bottom in this battle for knowledge.

In this connection I would suggest the law needs changing so as to make it obligatory upon the appointing power to select at least a working minority of the Board of Curators of the State University and Agricultural College from the ranks of the practical agriculturists of the State, as we are now in the anomalous position of furnishing a large part of the money to maintain the institution, as also the prestige, and in fact many of the students, and have no voice in its direction, its Board of Curators being filled entirely by professional men, and gentlemen of leisure, and many assert by political favorites. This should be remedied by legislation. The agricultural fund should be so kept on the books of the institution that its proceeds could be easily traced to the end originally intended. The State Board of Agriculture should be allowed enough to meet the requirements embodied in the report of the Secretary for 1889 and 1890, and to which I cannot do better than quote for the information of those who may not have received a copy of his report, viz.: "The number of copies of the annual report printed should be increased to 20,000, which would require $1,000 to distribute; $1,000 should be expended yearly in maintaining the weather service; $1,000 can be expended to good advantage in publishing monthly crop reports; $5,000 should be available annually with which to hold Farmers' Institutes; $1,000 are required for incidentals, such as fuel, lights, janitors' fees, postage, stationery, printing, expenses of members of annual meetings, etc., and $1,000 for clerical services in the office of the Secretary, making $10,000 a year, which is not more than adequate with which to properly carry on the work of the Board, even without undertaking new lines." I can fully indorse this estimate, and would further suggest that the proper legislation be had to remove the home of the Board to the seat of the State Government, that it may be more centrally located, nearer the other heads of departments, and that any undue control of the University people may not be suspected. Let us have a veritable head to our business, and elevate it to the standing it deserves by reason of its great prominence in our State.

Let us at least be willing to donate as much of the common funds to the better promulgation of information amongst the 300,000 farmers, as we give in salaries to the Board of Railroad and Warehouse Commissioners, and their clerk, $10,000, for which sum the principal act rendered the agricultural interests of the State during the past year, so far as I am informed, was the appointment of a lawyer to fill the vacancy caused by the resignation of another lawyer as Chief Grain Inspector. A lawyer to inspect grain is just as appropriate as a farmer to try a cause before the Supreme Court, and will result about as satisfactorily. If our wishes are properly presented to the present sitting Legislature, I have no doubt they will be honored with more alacrity than in times past, if our requests are tempered with judgment and a spirit of equal justice to every citizen.

WHAT CAN THE WOMEN DO TO MAKE THE FARM PAY?

By Mrs. E. G. Loring, and read at the Maysville, Missouri, Farmers' Institute.

I was invited by our worthy fellow-townsman, Mr. S. W. Cook, to write a paper to read before this meeting—the subject to be anything of interest along the line of improvement of the financial condition of the farmer's wife.

In turning to the paper which he handed to me at the time, I see that we ladies are to pay most attention to the "improvement of the farm home."

Just so; but how can we improve the farm home without money? Hence, at the beginning of this paper, I affirm that all subjects along this line are enveloped in the one great subject of how can we make the farm pay? a subject that concerns us wives as much as the husband.

I have been trying for ten years past to help make our farm pay expenses, and can only throw out a few suggestions as to the *how*.

I have found by experience, that raising corn and selling hogs alone will not pay. That much is good; but we must turn to other things for the little every day expenses of a family, so that when the hogs, with the other fall products of the farm, are sold in autumn, the accumulated store debt will not consume all the year's profit and leave nothing in store for the future. To do this, we must depend largely on the fruits, the hens and our cows.

To make fruits pay, we should begin with the strawberry. It is a fruit that does not fail in this section of the country once in ten years, and the market is always good, if one knows how to place them before the people in the right way. Selling in boxes is the preferable way to handle all small fruits. I hear from a woman in Baldwin, Kansas, who began strawberry culture for her home market some five years ago, and she found it so profitable that she enlarged her bed from a small strip in the garden to three acres, and found that still so profitable that she enlarged again, until last year, she had in ten acres of strawberries; bought and put up her own boxes; looked out a market in advance of the season, and her ten acres netted her $1,000, more or less. I might add here, that her husband is an experienced mill builder, and is gone from home for months at a time in his profession, and that may be one reason of her marvelous success. He isn't there to bother around. It would scare some of our husbands if we were to ask for even one acre of ground to have as all our very own.

As the strawberry crop closes, the raspberry season is beginning. And of that delicious fruit, the market here has never yet been half supplied and it is a fruit easily cultivated, easily handled. W. W. Howard, of Cameron, tells me that he makes his whole year's living off the profits of that one fruit alone. He ships 5,000 boxes and upward each year from three acres I think. At any rate, there is no good reason why any of us wives could not have a few acres of the farm set apart for us, and let us strive to make as much from our patch as husband and boys make from all the remainder. All these fruits can be cultivated by horse-power to a great extent – and should be. I leave the apples, plums, pears, etc., to the orchard and men. Women cannot well raise an apple and pear orchard.

There are plenty of instructions on small fruit culture that are sent to us free by the State Board of Agriculture.

The next important branch of farm industry is the poultry, which I should divide into three divisions: The greatest laying fowl, the one that matures quickest into a fry, and the turkey—our American thanksgiving bird.

I affirm here that a flock of 200 laying hens on a farm will produce eggs sufficient to buy all the groceries and flour that a family of ten persons will consume. And when our hens will supply that need, why don't we make her do it? Some people see money in raising chickens for early fries, but I never could. To me there is no money in early chickens sold at $1.50 per dozen.

There is money made in raising turkeys, one woman of my acquaintance sells a hundred dollars' worth of turkeys every year. It takes some labor and great care for three months in the spring—after that no trouble to speak of. Most any of us would work carefully three months for one hundred dollars. These few thoughts are thrown out simply to arouse in the minds of women the idea that *they* can do something to help along financially, and get more money out of less labor than they have been doing heretofore.

I might mention bee culture as a prolific source of profit, when well handled.

Each one of these branches of business spoken of ought to have a paper by itself. And I would advise that these questions be set apart for more thorough discussion next year when these gentlemen again visit us.

TWO WAYS.

From the Tipton Times.

The following essay was read at the Farmers' Institute in this city (Tipton) last week by Mrs. Geo. Dugan, of Sedalia, who is best known to the people of this State by the pseudonym of "May Myrtle." As mentioned last week, this paper was conceded to be one of the best presented, and we are sure will be read with interest by the readers of the Times :

There's a path that leads out from the shadows;
  Another that lurks in the gloom;
One basks in the light, as do meadows,
  The other is black as a tomb.

Yes, one has bright sunshine, and roses,
  The other, just mildew and blight;
One beauty supernal discloses,
  The other is darker than night.

I would that it were in my power to speak to this audience some of the intense thoughts which surge through my brain and and heart, as I contemplate the ills that afflict humanity.

How manifold they are, and how the tide of wretchedness seems to increase as the years go by, and how powerless are the few to improve the sorrowful condition of the many who silently and without complaint lead lives of wretchedness. There surely must be a way to health, to prosperity, to happiness, could we only find it. The good All Father who created this beautiful world never intended that his children should suffer poverty, and after fruitless struggles, give up the battle and die in despair.

Those who are tilling the soil are obeying one of his commands, and there can be no more dignified or noble occupation. So why should the farmer ever lose the finer sensibilities of his nature insensate as the clods he is cultivating. What hinders him from heading the list, in intelligence, and all those grand attributes which characterize the manliest man?

Is it his fault, or that of others, that his occupation is scorned and himself a byword and a reproach? In a large majority of cases the farmer who degenerates into a clod, if he is a man of average intellect, makes choice of retrogression. After due allowance is made for the effects of heredity, and of environment, the man who descends in the scale of being may be suspected of deliberately choosing to go that way. He who drifts with the current will inevitably go over the rapids!

A proper ambition is not a thing to be despised, and when a young man decides to be somebody he has made a long step in the direction of eminence. When one essays to climb a mountain, he must first consider that the ascent may be accomplished and then go up. There must be no flinching and no backsliding; he must continue to ascend until he gains the summit. To let go, even for an instant, means to fall back, and it is just so in the journey of life, just so in the building of character; there is no dead level; we must either go up or fall down. In your financial efforts the same law holds good. A mortgage on a man's farm is an awful impediment in his road to success; it is a huge boulder on the mountain side over which he must painfully climb, or he can never reach the top or view the promised land. Unpaid taxes fatten impecunious lawyers and leave the farmer and his dear ones houseless and without bread. Will you please explain to me how it happens that so many lawyers and city officials own real estate in the country? Is it not because of mortgages and taxes neglected? There is at every county seat in our land a "court-house ring" of this crafty, cruel devil fish. Every farmer must beware. He must also avoid litigation unless he wishes to move out of his home and bestow it on some modern interpreter of that vile compilation, understood only by the initiated, and called, by common consent, "law." What does this little word of three letters mean? Who can define it and give to it a name commensurate with its deserts? Does it mean justice? Alas! no, it has no analogy to or union with this grand word; it seems to me to imply only fees—fees to the lawyers, to the justices, to the judges, to the clerks, and to everything connected with it except to him who seeks justice. Law is a monster that will devour you if you give it an opportunity. Avoid it as you would a pestilence. Get rid of that mortgage, keep your taxes paid up, avoid quarreling with your neighbor, and the monster is powerless to harm you.

There is another thing which needs careful watching. It is called "politics." It is something terribly aggressive, and for ways that are dark and tricks that are vain will distance any heathen Chinee ever evolved from the brain of a poet.

There is a new party, it is called the "Farmers' Alliance," a very fine name, but what does it purpose to do? Already the politician has joined it, and I defy you to create parties faster than he can join them. Once in, he assumes control; that is his business; it is just what he has joined for, and he can attach your Alliance to one or the other of the political machines, as a tail is hung to a kite. Why your Alliance will merely serve to sail the crafty politician a little higher, and you will be no better off than before your new party had birth. It is not so much new parties that the country needs, as honest men to run the affairs of the old ones. Retire the old political hacks and put new men in their places, if you can induce an honest man to enter politics. Find honest men; it is your only salvation; and when some wily, smooth-tongued political aspirant comes to your door, whispering soft seductive lies, endeavoring to make you believe that salt is sugar, turn loose the dogs and run him away from your premises. Set it down as an infallible rule, that when a man devotes his time to office seeking, he does not deserve to hold one. I would advise you to give a little attention to monopolies and trusts; study these things for yourselves and not accept any politician's views concerning them. Learn what "tariff" means, and when you vote, do so with fearless intelligence, and not go to the polls like dumb driven cattle and cast your ballot only as "the bosses" command.

You need not forge for yourselves chains of bondage; they are being prepared for you rapidly enough, and the next generation will solve the question whether or not the workingmen of America are to be bondmen or slaves.

There is an organization called the "Knights of Labor." Noble knights they are, for they have paid into a common treasury the hard-earned dollars which have enriched their leaders, and now Mr. Powderly says it is whisky that is ruining the workingman. His fortune is made, he can now safely slur the laborer. Most of these political machines are run with human blood, and they are grinding men to powder. The aggregate wealth of this country is held by corporations and monopolies, and who dare deny that it should be more generally disseminated among the producing classes?

One Congressman who comes among you making fair speeches and pointing out to you your wrongs, went into Congress a poor man about eleven years ago. He is now financially rated at three millions of dollars. Some of you regard this man as a demi-god. You know what a Congressman's pay is; you may account for his wealth; I confess that it puzzles me to do so. Three millions of dollars. It is a very large sum; I hope 'twas earned honestly. I fear that there are coming dark days for the next generation—days of bloodshed and terror—but these horrors may be averted by wise legislation, and the power to preserve peace and prosperity to the entire nation lies in the hands of the farmer, the mechanic and the laborer. The workingman may be an autocrat or he may be a blot on civilization, just as he chooses. He may be the arm that wields the hammer, or he may be the iron that receives the blows. He may be something or nothing, just as he determines. There are but two ways: one leads upward to intelligence, to prosperity, to honor; the other leads downward, to poverty, ignorance and disgrace. There is no middle ground, you are somebody or nobody. Which path do you choose?

You are going one way or the other;
  Each step leadeth deep into gloom,
Or out into light, my brother;
  Be warned from the heedless man's doom.

One pathway is guarded by angels,
  In garments of radiant white;
The other is watched by dark demons,
  Who scoff at the words "truth" and "right."

Which way do you take, my brother?
  'Twas in that the wretched have trod.
Will you walk safe in the other,
  Which leadeth to peace and to God.

REPORT

OF THE

STATE VETERINARIAN

OF MISSOURI.

REPORT

To the Thirty-sixth General Assembly, Jefferson City, Mo.:

GENTLEMEN—I beg leave to report to your honorable body, within the provisions of section 8791, Revised Statutes, the labors of the State Veterinary Sanitary office of Missouri, as performed under the law of 1889, with such other matters as I consider of interest to the people.

In the first place, it is necessary perhaps to state that, for some cause unknown to the writer, the appropriation act was not inserted in the last Revised Statutes, and it was a long time after its passage that the proper State officials pronounced the whole act a law. As a result, active sanitary work in 1889 began only late in the summer. No regulations were made that year to prevent Texas fever, and we had not at hand the language of the appropriation act to guide us.

DUTIES OF THE STATE VETERINARIAN.

The duties of the State Veterinarian, as prescribed by sections 8776, 8779 and 8781, are as follows: To attend to contagious, infectious and spreading diseases of animals, "and give such aid and instructions as he (the State Veterinarian) may think best for the prevention or cure of such disease with which he may find (said) stock affected, and request the petitioners (who petitioned for his service) to report to him, in writing, the results of the treatment prescribed." (See section 8779.) He shall also, if he thinks best, enforce quarantine (see section 8781) and prescribe disinfection (see section 8784); and he shall, besides, investigate "the nature, causes of and remedies for diseases of mules, cattle, swine and other domestic animals, and shall teach the knowledge thus obtained to the students of the State Agricultural College and University who may wish to attend." (See section 877 9.)

It will be readily observed that these duties are great, varied and complicated. It has been extremely difficult to fulfil them completely to the letter. But wherever the letter of the law could not be absolutely followed, the spirit was always closely respected.

SANITARY WORK AND OTHER LABORS.

The sanitary work and duties proper may be divided into four classes: First, services rendered to the people on receipt of petition under section 8778; second, services by authority of section 8780, rendered to the people on learning from any satisfactory source of certain diseases existing in any locality of the State; third, services by authority of sections 8785 and 8786, in case of quarantine regulation by proclamation of the Governor; fourth, experimentation and teaching.

Besides these four classes, however, there is another which consumes nearly one-fourth of the time, which is unavoidable, and yet not specified in the act, though naturally implied by its scope, nature and general language. It is the services rendered daily to numerous different citizens in every county of the State, in answering by letter questions concerning all kinds of animal diseases. This correspondence service, which would make, if reported in full, a bulky volume, and much of which is in reference to diseases of a non-contagious character, and therefore not positively contemplated by law, is seemingly unavoidable. A man writes; he must be answered. Some explanation must be given him. When time allowed, these correspondences concerning ordinary maladies were always fully answered to the best of the Veternarian's ability; but when too much pressed with work enjoined by the law, then he had to excuse himself. But the cost of replying, not counting the time, is a serious item in the end, no matter what reply is made.

Under the first and second classes of services mentioned above, the State Veterinarian and deputies visited the following counties and attended to the affections specified in the following table. But this does not include the thousands of miles traveled under the Governor's orders, nor does it include the affections prescribed for in our studies, and services rendered daily and constantly to correspondents making inquiries and requesting aid to cure or suppress various diseases in their localities; nor does it include the arduous labors of experimentation and investigations of a scientific and practical character. It is merely a tabulation showing the work done under orders within section 8778, or within 8779, Revised Statutes 1889:

COUNTIES OFFICIALLY VISITED IN PERSON ON REQUEST OF THE PEOPLE, AND MALADIES THERE ATTENDED TO.

Counties.	Glanders	Texas fever †	Black-leg	Tuberculosis	Actinomycosis	Decayed teeth	Pseudo gonorrhœa	Distemper	Strangles	Nasal gleet	Laryngitis	Pneumonia	Fistula	Rabies	Purpura hæmorrhagica	Paralysis	Catarrh	Tabes mesenterica	Tumors	Necrosis	Spinal meningitis	Anasarca	Corn smut (?) poisoning	Epidemic aphthous fever in cattle	Swine plague	Septicemia	Liver flukes	Hog cholera	Mad-itch
Adair	4																												
Audrain																								45					
Barry	1																												
Barton	28	40																			25								
Bates	19	11																											
Benton		9																											
Boone		10						5	2			1												162	50				
Callaway			6																	1									
Carroll	8											1			2														
Cass		20			13	1																							
Chariton	3						94																						
Clark				42																									
Clay	14																												
Clinton													1																
Cooper	4	23																											
Cole																													
Crawford		*800										‡5												3					
Dade	11					2													1										
Daviess	7									1																			
Franklin	2																												
Greene																				1									
Grundy	21									1	2																	12	
Harrison														25															
Henry	1		15	90	23																								
Howard																								15					
Jackson	15			2	26				4	1																			
Jasper	2	200				1																							
Laclede	9																												
Lafayette	20	25							8	2			1			4	2												

COUNTIES OFFICIALLY VISITED—Continued.

Counties.	Glanders	Texas fever †	Black-leg	Tuberculosis	Actinomycosis	Decayed teeth	Pseudo gonorrhœa	Distemper	Strangles	Nasal gleet	Laryngitis	Pneumonia	Fistula	Rabies	Purpura hæmorrhagica	Paralysis	Catarrh	Tabes mesenterica	Tumors	Necrosis	Spinal meningitis	Anasarca	Corn smut (?) poisoning	Epidemic aphthous fever in cattle	Swine plague	Septicemia	Liver flukes	Hog cholera	Mad-itch
Lawrence	1																	21											
Lincoln																								100					
Linn	1																						8						
Livingston	1																												
Macon	10					2																							
Marion	7																							6					
Mississippi	4																												
Monroe		20										5																	
Moniteau	4																1												
Morgan						1																							
Newton				35																	2								
Osage	2							5																					
Pettis	2								24																				
Pike																								10					
Platte	4																												
Polk		54																											
Pulaski	1																												
Putnam	3																												
Ralls	5																												
Randolph		5																						19	40		‡10		7
Ray																										‡5			
Saline		30																											
Scotland			30	1																									
Scott	4																												
Shelby																					14								
Sullivan	8					1		10				1										1							
St. Louis	13	12			6																			2					
St. Charles																								210					
Vernon	2	33																											

Washington	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	12	....
Webster	2	....	....	....	....	....	....	....	18	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Texas	....	35	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wright	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Total	244	1322	51	170	68	8	94	20	56	5	2	13	2	25	2	4	3	21	1	2	41	1	8	578	90	5	10	24	7

Grand total of cases attended on request, 2,877. Total number of official trips made by veterinarians to attend to all those cases is 233.

† Of the 522 cases mentioned in this column, fully one-half occurred in two months of 1889. Before mid-summer of that year—*i. e.*, before the veterinary law was declared in force—we had as many again, but they are not recorded under the present act.

* These 800 cattle were Texans, and we were called to quarantine them. They should not be called cases of fever.

‡ Estimated from reports.

This tabulation includes but a few of the cases of epidemic Aphthous fever in cattle and the epidemic spinal meningitis of horses that occured in this State this year. A special notice of these occurs elsewhere in this report.

The duties of the third class specified above were such as were made imperative by the following proclamation of the Governor, to prevent as much as possible Texas fever from being introduced into the State in 1890:

PROCLAMATION BY THE GOVERNOR.

By authority vested in me, and in accordance with section 8785 of the Revised Statutes of 1889, I, David R. Francis, Governor of Missouri, having approved of the following quarantine regulations adopted by the State Board of Agriculture, for the purpose of preventing the spread of contagious diseases among cattle, do hereby promulgate same and order that the same be observed and enforced throughout the commonwealth.

Whereas, the United States Department of Agriculture declares that "splenetic or Texas" fever exists in all that country lying west of the Mississippi river, and south and east of a line commencing on the Mississippi river at boundary line between Missouri and Arkansas; thence running westward on said boundary line to the eastern boundary of the Indian territory; thence running northward to the southern boundary of Kansas; thence westward along said boundary of Kansas to the 100th meridian of longitude; thence southward along said 100th meridian of longitude to the southern boundary of Childress county in Texas; thence westward along the southern boundary of the counties of Childress, Hall, Briscoe, Swisher, Castro and Parmer to the eastern boundary of New Mexico; thence south along the eastern boundary of New Mexico due south to the Rio Grande river; thence east and south along said river to the Gulf of Mexico: be it ordered by the State Board of Agriculture and the State Veterinarian assembled, within the provisions of section 8785, Revised Statutes, 1889, that the following rules and regulations shall be adopted as therein provided for:

First. All shippers of cattle from within these limits must have said stock branded or otherwise marked with indestructible tags or other signs to secure their identification, and the person or persons in charge of said cattle before transportation, before transporting them into the State of Missouri, must be provided with a duplicate affidavit of two responsible parties, whose reliability shall be certified to by the county clerk or circuit or district court clerk, or by a justice of the peace nearest to the range whereon the said cattle have been held. Such affidavit shall set forth, (*a*) the name and postoffice address of the owner, consignor and consignee; (*b*) the brands, tags or other marks; (*c*) the total number of cattle seeking admittance into Missouri, and the county or counties in which such cattle have been held during the preceding ninety days.

**Second.* All railroads, transportation companies or individuals, on or before transporting or driving through or into the State of Missouri any cattle from the above described territory, shall examine carefully the affidavits of the shipper, or party in charge of the cattle, and shall keep one of said affidavits, and there and then the person receiving said affidavit for the company shall certify to the genuineness, in writing, giving date and place of such action, and signing his name to it.

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* There was no regulation to protect the State from Texas fever in 1889. The veterinary law was pronounced constitutional at a too late date. P. P.

The railroads or other transportation agencies or companies shall file the affidavits thus received, or a certified copy thereof, with the State Veterinarian at Columbia, Mo., at least once a month. All individuals who shall drive cattle into Missouri from the aforesaid country shall also file a similar affidavit at the time with the State Veterinarian.

Third. All the public stock-yards which shall keep Southern cattle within Missouri shall provide for use, between the 1st of April and the 1st of December, 1890, a sufficient number of pens to be used exclusively during that period for the accommodation of cattle coming from within the territory above described. Such pens shall be marked or designated by reasonably large signs, conspicuously posted and bearing in plain and large letters the words, "Southern Cattle Pens." And all public stock-yards shall, in the first week of April next, file with the State Veterinarian an affidavit setting forth clearly that they have complied individually with this section of the rules and regulations.

Fourth. Cattle coming into Missouri from territory within the above described boundaries shall not, during the period aforesaid, be kept, grazed or watered on public ranges, unfenced lands, highways, State lands, or within the corporate limits of any town or city within the State of Missouri, unless quarantined in accordance with article 3 of chapter 167, Revised Statutes, 1889.

Fifth. The State Veterinarian shall, as far as practicable, co-operate with the United States Department of Agriculture in the enforcement of the regulations prescribed in its circular letter of February 24, 1890, addressed "To the managers and agents of railroad and transportation companies, United States," the object of which is to prevent the spread of Texas fever, and in which the following directions for disinfection are set forth:

The cars used to transport such animals and the pens in which they are fed and watered, and the pens set apart for their reception at points of destination, shall be disinfected in the following manner: (*a*) Remove all litter and manure. This litter and manure may be disinfected by mixing it with lime, diluted sulphuric acid, or, if not disinfected, it may be stored where no cattle can come in contact with it until after December 1. (*b*) Wash the cars and the feeding and watering troughs with water until clean. (*c*) Saturate the walls and floors of the cars, and the fencing, troughs and chutes of the pens, with a solution made by dissolving four ounces of chloride of lime to each gallon of water, or disinfect the cars with a jet of steam under a pressure of not less than fifty pounds to the square inch.

Sixth. The State Veterinarian may appoint deputies and inspectors to aid him in the enforcement of the above regulations, and they are hereby empowered to quarantine, under such rules as may be prescribed by the State Veterinarian, all cattle brought into the State in violation of these regulations.

Note.—These regulations are adopted by authority of section 8785, Revised Statutes of Missouri, 1889, and if approved by the Governor, the same section provides a penalty for violation, of a fine of not less than $1.000 nor more than $10,000 for each and every offense, to be recovered in any county into or through which such stock is brought.

In witness whereof, I have hereunto set my hand and caused to be affixed the great seal of the State of Missouri, this 15th day of March, A. D. 1890.

[Seal] David R. Francis,
Governor.

By the Governor:
A. A. Lesueur,
Secretary of State.

These regulations were very beneficial, though they did not entirely prevent the introduction of Texas fever. Aided by the United States government, they were very effective, and reduced the occurrence of Texas fever greatly, as will be seen further. The office work was greatly increased by these beneficial regulations, however, and a force of inspectors distributed at St. Louis, Kansas City, St. Joseph, Hannibal, and for the railroads, became necessary. The names of these will be seen further. The railroads as a rule obeyed the regulations well, though some did transgress somewhat.

Now it will be remembered that in the year 1889 the new veterinary law was declared in force in midsummer. Hence we had no quarantine regulations against Texas fever that year, but were as vigilant as we could be under the general quarantine clause in section 8781.

Now in aggregating all the cases of Texas fever attended to and reported since the proclamation of Governor Francis in 1890, and all the cases similarly ascertained as having existed in a corresponding period prior to the enforcement of the new veterinary act and the quarantine regulations, I find, from all sources, that we had in 1890 scarcely 10 per cent of the cases of the former space of time. And this is our first endeavor in this direction in Missouri. The quarantine regulations of the Governor, the State Board of Agriculture and the State Veterinarian, were far from perfect, and may be improved next year.

Besides this, the appropriation was insufficient, became exhausted before the expiration of the quarantine term, and hence we were greatly hampered in our enforcement of the same.

The following documents and letters were issued as a result of this proclamation, to various corporations and officers, and are self-explanatory:

LETTER ADDRESSED TO RAILROADS AND STOCK-YARDS,

With the Governor's Proclamation and a copy of affidavit. as hereinafter given.

Dear Sir—Enclosed please find rules and regulations regarding Texas fever, and the introduction of Southern cattle into the State of Missouri between April 1st and December 1st.

I would have forwarded you a copy sooner, but I have just this day received the proclamation from the Secretary of State.

As it is very desirable to have uniform affidavits and certificates, I enclose a blank copy of the form that I am endeavoring to have adopted generally. I sincerely trust that you will see fit to adopt it in your traffic if such a course is necessary under the rules and regulations.

Very respectfully yours,

Paul Paquin,
State Veterinarian.

April 3, 1890.

NAMES OF RAILROADS AND STOCK-YARDS

To whom certificates of admission and copies of the Governor's Proclamation were sent.

General freight manager Missouri, Kansas and Texas railway, Sedalia, Mo.

General freight manager Missouri Pacific railway, St. Louis, Mo.

General freight manager Kansas City, Texarkana & Gulf railway, Texarkana, Texas.

General freight manager St. Louis & San Francisco railway, St. Louis, Mo.

General freight manager Kansas City, Fort Scott & Memphis railway, Kansas City, Mo.

General freight manager Chicago & Rock Island railway, Chicago, Ill.

General freight manager Chicago & Alton railway, Chicago, Ill.

General freight agent Wabash Western railway, St. Louis, Mo.

General freight agent Texas, Sabine Valley & Northwestern railway, Longview, Texas.

General manager Kansas City, St. Joe & Council Bluffs railway, St. Joseph, Mo.

General manager Hannibal & St. Joe railway, St. Joseph, Mo.

General manager Atchison, Topeka & Santa Fe railway, Topeka, Kans.

General manager St. Joseph, St. Louis & Santa Fe railroad, St. Joseph, Mo.

General manager Chicago, Santa Fe & California railway, Chicago, Ill.

General manager Illinois & St. Louis railway, St. Louis, Mo.

General manager Chicago, St. Paul & Kansas City railway, St. Paul, Minn.

General manager Houston & Texas Central railway, Houston, Texas.

Manager Union stock-yards, St. Louis, Mo.

Manager National stock-yards, St. Louis, Mo.

Manager Hannibal stock-yards, Hannibal, Mo.

Manager St. Joseph stock-yards, St. Joseph, Mo.

Manager Kansas City stock-yards, Kansas City, Mo.

Mr. Palmer, superintendent of stock-yards, St. Louis, Mo.

Mr. H. P. Childs, superintendent stock-yards, St. Louis, Mo.

The managers of every other stock-yard in St. Louis.

Certificate or Affidavit of Shippers of Southern Cattle into or through the State of Missouri.

We, the undersigned, hereby testify to the following:

First, that........................P. O. address .... county of............................., State of........................ ..., is the owner of.............................. head of cattle, seeking admittance into or passage through the State of Missouri, and to be shipped from..................... ....via the............................railway (or boat) within the next three days.

Second, that the name of the consignor is....... .... P. O. address..................... ......, county of.............................. State of ...., and the name and address of consignee are .. .., county of ...., State of ....

Third, that the marks, brands or tags on said cattle are as follows:

A lot of............................head with ....

A lot of............................head with ....

A lot of........ ....head with..............................
....

A lot of............................head with ....
....

Fourth, that said cattle have been kept during the last ninety days in the county of..........................., State of........................., and no other place.

Dated at........................... Signed...............................
the...........................1890. ....

Certificate of County, Circuit or District Court Clerk or Justice of the Peace.

I hereby certify that the parties who have signed the above are known to me, and are reputable, responsible citizens of..............................in the county of...................... ......, State of................ .... I hold the office of..............................., at..........................State of ....
Signed.........................

Verification of the Railroad or other Transportation Agent.

I have this..................... day of..........................1890, carefully examined the above affidavit and certificate, and to the best of my knowledge and belief they are genuine. I therefore accepted.......................head of cattle for transportation to..........................
Signed.................. ....
Agent for the.........................

Done at.........................station,
On the.........................railway.
State of..............................

CIRCULAR A—TEXAS FEVER.

GENERAL INSTRUCTIONS TO INSPECTORS OF LIVE-STOCK,

Under Veterinary Surgeon act of 1889, and to enforce the Texas Fever Quarantine.

First. When the brands or marks of any Southern cattle, or when their history or want of knowledge concerning their history for the preceding ninety days, shall make it appear possible for such stock to convey Texas fever, the owner or person or persons in charge shall be requested to show the affidavit demanded in section second of the proclamation of Governor David R. Francis, dated the 15th day of March, 1890, and then if said cattle are found to be truly from within the boundary defined in the preamble of said proclamation, they shall be ordered in Southern cattle pens, or in separate pens, and forbidden to run at large when unloaded.

Second. The public stock-yards shall be requested to keep all Southern cattle coming from within the aforesaid boundary in special pens as designated in section third of the Governor's proclamation. Any cattle found in those pens are already cared for according to law, but people purchasing them should be warned not to let them at large anywhere, under penalty of damages under the statutes.

Third. Any cattle from Texas, Arkansas or the Indian territory found grazing, watering or pasturing in public ranges, highways, unfenced lands, and within city or town limits, shall be arrested and enclosed in the nearest safe enclosure that may be legally used, and there kept in quarantine until December 1, 1890, at the expense of owner, unless owner, or person or persons in charge, shall prove by affidavit under the proclamation, or by other means, that said cattle did not come from within the boundary aforementioned. Whenever dangerous Southern cattle shall be found to have been thus at large where native cattle are liable to be exposed, the fact shall be proclaimed, and the people in the neighborhood shall be warned of the danger by public notices or circulars, or verbally or through the town or city-authorities.

Fourth. Unless a United States officer is looking after the disinfection of cars, etc., the inspectors shall see to this matter, as prescribed by section fifth of the proclamation. Pens used exclusively for Southern stock need not be disinfected.

Fifth. The inspectors shall keep clear records of their labors, travels, inspection, the number of Southern stock quarantined, the way in which the stock-yards, railroads and shippers follow the rules and regulations of the State Board of Agriculture as explained in the Governor's proclamation, and shall report fully every first of the month to the State Veterinarian.

NOTE.--Nothing in these instructions shall be so construed as to interfere in any way with the transit of cattle from any market or yard direct to the slaughter-houses, but not even butchers shall be allowed to keep stock in any locality where natives may become infected.

PAUL PAQUIN,
Missouri State Veterinarian.

Columbia, Mo., April 15, 1890.

INVESTIGATIONS, ETC., UNDER SECTION 8776.

This part of the State veterinary service cannot, under the existing law, be carried on as economically and as effectively and with as much benefit to the State as it might be under different circumstances. The study of obscure and misunderstood diseases of live-stock, many of which cause such heavy losses to the State and the people individually, is a most difficult task, and demands constant inquiries into the mysteries of animal life, both in the field and in the laboratory.

Interrupted investigations of the kind, while they point the way, dissipate the cloud of ignorance, reveal many interesting and useful facts, and rouse our hopes, they are not entirely satisfactory, and the results must often be faulty.

Again, interruptions in such investigations and in experimentation are costly, and the success or failures apt to be unjustly criticised by those who are unfitted by lack of scientific knowledge, and who wish to parade knowledge (that they may or may not have) for personal ends and ambitions.

Thus in the last two years our experiments and investigations have been limited and humble, owing to the great increase of office and field work. Still we have done something useful in the study of Texas fever, black-leg, big-jaw, etc. These points will be treated presently.

As to teaching, it is painfully unsatisfactory to the students and the State Veterinarian. A number of agricultural, medical and other students are anxious to learn something about animal diseases, and the official work makes it generally impossible for me to attend to them properly. The classes in the University are regulated; at certain hours certain subjects are heard by different professors. Therefore, in order to teach to the students as prescribed by law, a certain hour must be set apart for the purpose. Now, if at this hour the State Veterinarian is officially engaged, he cannot meet the students and they lose their time. It is very aggravating and damaging to them and to me, and I may say it is not right.

To ameliorate as much as possible this state of things, Mr. Evans, assistant of the veterinary laboratory, and under the Agricultural Experiment station, kindly consented to teach whenever he can when I am absent. This he has done gratis. To still further follow the spirit of the teaching clause, we have, every Monday (a day when there is no attendance at the university), free clinics, where diseased live-stock is examined, studied and prescribed for in the presence of and for the benefit of students. We thus have object-teaching, which, with the lectures that we manage to give, fulfill as nearly as possible the teaching clause of section 8776.

TEXAS FEVER.

This affection is one of the most serious embargo on our cattle-raising and cattle markets. In the first place, we have the whole Southern states desirous of improving their cattle, but we cannot and dare not, because there our cattle die of so-called Texas fever. We are thereby effectively debarred from this great outlet for our improved cattle. On the other hand, our State is admirably suited to graze the Southern cattle, but we cannot, dare not admit them freely and economically because they bring our stock Texas fever. Realizing the importance of this question, we have, favored by his Excellency, Governor Francis, and the honorable Board of Curators of the State University and Agricultural college (under authority of law), chosen this misunderstood malady as one of those to be investigated under section 8776.

The State Veterinarian visited Texas and the Indian territory to study the disease at home. This was one of the first steps.

The first impression on him there, was the immunity which Southern cattle on Southern ground constantly enjoy against Texas fever. Born in the South, so long as they live in contact with the cause of the disease they resist it. The question that struck my mind then was: Why is it so? Why are the Southern cattle proof against the fever? If they are proof, why cannot we render our Northern cattle likewise, before or after shipping them South, and thus open a new market for Northern cattle?

Again, it occurred to me that perhaps, if we found the actual cause of this fever, we might prevent the Southern stock from carrying it North to our pastures. With these thoughts in mind, we began to work, aided by our own State Agricultural Experiment station and the Agricultural College stations of Texas and Arkansas, to find: First, the cause of the disease; second, the cause of immunity (proof condition) of Southern cattle against Texas fever; third, the means of conveying the disease; fourth, methods of prevention by inoculation; fifth, methods of cure and prevention by remedies.

In all these we had in mind constantly the acclimation of Northern cattle South, the various atmospheric and telluric (soil) conditions in the South, and the means of stock transportation North and South.

Among our first important points cleared was the fact that Texas cattle were not proof against Texas fever a few months after they were removed from the influences of their native infectious soil. We found that Texas cattle brought into Missouri, and again exposed to Texas fever a couple of months afterward, contracted the malady as easily as ours and died rapidly. We found also that Texas cattle, when kept in stable for several weeks, even in Texas, entirely removed from the pastures where the germs exist, become as susceptible as ours, and when again placed on pastures infected, die of Texas fever. I have known Southern cattle thus treated in preparation for a fair, and then die when exposed outside. What then made these cattle resist the fever so long as they remained on infectious ground South? We reasoned thus:

The disease must be one of those inoculable kind in which one attack or vaccination protects against another for a very limited time, and the calves born South, from the cows impregnated with the germs of this disease, are probably vaccinated, as it were, through the mother's blood, or the germs act mildly when first taken by a very young calf, and these gradually become inoculated on the grounds after birth. In either case it must be a process of vaccination, natural or accidental. What then was more rational than to think at once of putting our cattle on the same footing by direct inoculation whenever Northern people shipped cattle South? This problem we studied as closely as our finances and our time permitted (being unfortunately much hampered by official duties of other nature). Bulletin No. 11, on Texas fever, published for 1889, shows the work done in that year. The result of the work for 1890, so far as inoculation is concerned, is still under way, and not ready for publication.

In this problem of inoculation we worked long to discover the germ. We found several of these in connection with the diseased tissues, and among them one seemed to be the actual causative agent.*

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* Dr Salmon, of the Bureau of Animal Industry, believes the germ of Texas fever similar to that of malaria in man. He believes that malaria and Texas fever are about identical, though more severe in the latter.

We produced Texas fever by inoculation of spleen pulp of Northern diseased cattle. We pointed out that Southern ticks† could carry the disease to the North, and we produced finally, by inoculation, disorders in the blood and fever resembling Texas fever much, but generally milder, though we did get some typical cases in all appearance. We hoped that preventive inoculation would be an easy matter. We were mistaken; it proved a most difficult task.

It would take too much space to give results in detail in this report. Besides, Bulletin 11, already mentioned, and our coming bulletin of this year's work will explain fully. But I will state here in a few words that prevention of Texas fever by inoculation is within the range of possibilities, but as yet much experimentation is needed to search for a safe practical method. This will cost many cattle and much money. As it interests many other States, the United States government should make further investigations in that line under the Department of Agriculture.

Medical Curative and Preventive Treatment.—Besides instituting researches with the ultimate object of preventing by inoculation the occurrence of deadly form of Texas fever in stock exposed to its germs, we also experimented with various remedies to cure it in already affected cattle. The great difficulty in the way to accomplish this was the enormous amount of work on our shoulders, and the fact that we are generally called upon, or can reach outbreaks of the disease when it has already taken such a hold as to have broken down the tissues of the body beyond repair by any human agency.

We have, however, succeeded in evolving a formula which has given great satisfaction in many instances, and which when perfected may play an important part against Texas fever at home, and even in acclimating Northern cattle in the South.

Take Iodol, one ounce;
Salol, two ounces;
Benzole, } each four ounces.
Alcohol, }

Dissolve the iodol in the alcohol, and the salol in the benzole, and then mix the two liquids together. The preparation will assume an almost ink-black hue, and during its mixture the temperature falls as low as 37° F.—very cold indeed.

To this we have occasionally, for experimental purposes, added crude petroleum to the amount of four ounces.

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† Since then the Bureau of Animal Industry, Washington, D. C., under Chief Dr. Salmon, claim, in their report of a few weeks ago, to have discovered this fact, and they, I am informed, give us no credit for having pointed it out a year ago. I have not this report, and cannot say if this is true or not.

The results point to the fact that this latter adjunct is beneficial, though probably not indispensable. However, we had the most of our good results with it. The dose is one to four tablespoonfuls, according to age and size. One dose is often sufficient, whilst in other cases three doses a day for one or more days are necessary.

The method by which a cure may be effected in many cases is by classifying them: First, the cases which are just beginning to show the fever. Second, the cases with high fever, ill for some little time perhaps, but showing no prostration or bloody urine. Third, cases with either prostration, bloody *(or dark) urine or both.

In the first cases the disease is generally amenable to the treatment prescribed (and to no other so far as I know). In the second a large percentage may be cured under favorable circumstances.† In the third very few cases recover under the best conditions. The explanation of this variety of action lies in the fact that at the beginning of the invasion of the body by the germs of Texas fever there are no serious changes in the blood, but these alterations gradually take place as the disease progresses, and finally extreme gauntness, nervous symptoms, prostration and highly colored urine give evidence of more or less serious disintegration of the spleen and blood, which usually lead to death. The remedy is intended to prevent these changes as early as possible, and not to reproduce new tissues, and to prepare fresh blood to substitute for a broken-down spleen and poisonous blood.

BLACK-LEG.

We have tested the French method of inoculation against this disease, and I am convinced that as a prevention it is to this date the remedy. I give the following extract from our Bulletin No. 12 on the subject (and which gives further treatment):

"The first thing to do in a case of black-leg is to remove at once from the place where the malady started all the stock showing no sign of the disease, and leave the sick ones there. Place the apparently well ones on higher and dryer lands if possible, or in a yard or open, well-ventilated stable, and feed them dry fodder for a week or so, and give them plenty of good, clear water—not filthy, stagnant pond or pool water.

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*The dark coloring of the urine is really not due to blood, but changes brought in the red blood corpuscles by the action of the germs living at their expense and eliminated through the kidneys.

†In the South relapses are possible, but these even may be guarded against in a large measure by the same treatment under favorable circumstances.

"During that period if you can procure black-leg vaccine properly prepared, inoculate every subject twice, *i. e.*, at six or eight days interval, and then nearly all, if not absolutely all, will be in a position to resist the germs of black-leg, no matter where exposed, and where they may find them."

BIG-JAW.

This cattle disease, so prevalent in Missouri, has been investigated as to its nature, cause and transmissibility from annimal to animal, or from infected pastures, etc. The following is a partial result of our inquiries:

In 42 post-mortem examinations in cases of actinomycosis (or big-jaw), at which I was present, the actinomycosis lesions were found distributed as follows: In the lungs in 6 cases; tongue, 5 cases; liver, 11 cases; intestines, 19 cases; post-pharyngial (throat), 7 cases: maxillaries (jaws), 35 cases. It will be understood, of course, that several had many organs affected. In some the inferior maxillaries (jaws), lungs, liver and bowels were diseased, and in others only a local external lesion with or without suppuration.

We conclude, therefore, that the disease is one which renders the beef of cattle so affected, dangerous and unfit for food. It is a parasitic disease—*i. e.*, a malady due to a vegetable parasite—and consequently it may spread from cattle to cattle, and from various places. either directly or indirectly. It is our duty, therefore, to attend to this affection under the veterinary act, and we have done so since last May.

NOTES ON OTHER DISEASES.

GLANDERS.

No attempt has been made to find a remedy to cure this malady. Its contagiousness in man and its usually deadly and always wretched effects on his body are such as to preclude the possibility of researches with safety, unless much time and money is available to obtain the safest and most favorable conditions.* Cases of glanders have always been quarantined or killed under sections 8781 and 8783.

This is one of the most difficult diseases to attend to properly under the law. It seems that a great number of horse owners would rather take the opinion of an incompetent, ignorant charlatan, or prender, than the opinion of a trained, scientific, qualified veterinarian, ho has devoted many years of his life exclusively to the study of nimal diseases, and in particular to those of contagious nature. When e consider that the official veterinarians of Missouri see glanders very week in the year and sometimes daily, in all its peculiarities, and he variety of its appearances, it is strange that so much difficulty is so ften encountered to convince the owners of glandered stock of their wn danger. In such cases we use no coercion, but firmly adhere to he law to protect all interested. I remember a case in Grundy county hich I had to hold in quarantine for months, and I had to inoculate nd kill with glanders produced by such inoculation, guinea pig after guinea pig* to satisfy the owner. And then, when we did take further ction, under oath of office, as our conscience and duty forced us to do, we were unjustly criticised by some who presumed to know much bout veterinary science, because they said they had had much experience with stock. Does such experience qualify a man to practice medicine among the lower beings, which cannot speak, and in which, therefore, the matter is tenfold more difficult than the practice of medicine in the human family? The cause of this presumption on the part of certain people unqualified by special training and education to diagnose the ailments of live-stock, lies largely in the fact that various forms of catarrhal affections of the head simulate the specific catarrhal discharge which occurs in glanders; and the further fact that most of people consider glanders a disease apt to spread like wild-fire, whereas it spreads very slowly, is often chronic, and often so mild as to make it absolutely impossible for any other than an expert to detect the nature of the malady.

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* One man in Kansas City and one in St. Louis have died from glanders within the last two months.

TUBERCULOSIS (CONSUMPTION).

Consumption in cattle prevails in a slight degree, probably in every county of the State, as it prevails in man. It is one of the maladies which men unqualified to judge insist is not contagious. But it is contagious nevertheless; we have repeatedly transmitted it in our laboratory from animal to animal, and from people to animals, simply by inoculating discharges from infected animals, or sputa from consumptive people to healthy animals. The contagiousness is beyond dispute. Authorities abroad and in this country all agree on this point, and have proven that men may become consumptive by drinking milk from a consumptive cow having lesions in the udder, or by eating insufficiently cooked meat of consumptive animals. A glance at our tabulation of cases attended on request shows that we have been officially called to serious outbreaks of that disease.

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*The guinea pig is the most susceptible of small and cheap animals to glanders. Hence, we use it for inoculation purposes to test the discharges of sores or from the nostrils of doubtful cases. We can thus determine satisfactorily.

Koch's treatment, if it proves effective in man, will doubtless be equally so in cattle. We hope to have an opportunity to test it.

APHTHOUS FEVER.

There have existed in this State this year, not less than 3,000 cases of a peculiar fever among cattle, which for a time caused much alarm among stock-owners. It was feared by several parties to be the true foot and mouth disease. Our office was besieged all at once with letters from various counties asking help. We, therefore, issued a circular letter setting forth a treatment and begging not to be alarmed. and to wait the completion of an investigation which we had at once instituted. This circular had its effect in Missouri. We issued it to benefit those suffering, as we believed our duty to be, and we had not the force nor the time nor the money to reach in person all the afflicted at the same time. I here give an extract showing the nature of the disease and treatment:

The cattle appear gaunt and gaunter day after day for want of food. If examined, the nose may be found hot, dry, and sometimes wine-color in patches. Blisters appear on the inside and on the margin of the lips, which become more or less raw and bleed easily. The pad (upper jaw gum corresponding to the front teeth of lower jaw) also presents blisters which soon break, from a thick, yellowish, cracked, soft crust. Sometimes the tongue is blotched or blistered, but rarely. There is much drooling of stringy, watery matter from the mouth, and the odor is anything but agreeable—often very fetid indeed. Those yellowish crusts slough out in a few days and leave raw surfaces or sores. There is occasionally a peculiar smacking of the lips.

In a few cases complications arise by which gandrene (rotting in fact) of the gums extends to the jaw-bones or teeth, and in a few instances the teeth become loose and even drop off.

Most of the cases become lame and stiff from the same lesions or inflammation breaking about the feet. Occasionally also, blisters and consequent results (scabs, crusts and even raw sores) occur on the udder. In three or four these appeared on the neck, the belly, the back and about the root of the tail. Uncommonly there is diarrhea. The malady runs its regular course in an average of about eight days. The shortest course I have noticed was five and the longest eleven. There are irregular or complicated cases which last much longer. Fever more or less intense keeps up most of the time. The type is very mild, death rate being so far as I can learn, less than one in two hundred.

Preventive and Curative Treatments.—1st. Separate all of the sick and suspicious from the healthy stock, leaving the former where the disease began and putting the healthy in a new pasture or lot.

2d. Wash or swab the mouth twice a day with a solution of borax and alum, or both combined: *i. e.*, a wash composed of a tablespoonful or more of pulverized borax and alum to a pint of water.

3d. Watch very closely the healthy stock, and separate every new case as gauntness appears, or as any suspicious symptom may present itself, such as lameness, stiffness, dullness, dry nose, difficulty in taking food, etc., etc.

4th. Persons attending to such diseased stock should not visit pastures or places occupied by healthy stock, whether on their own property or at their neighbors'. All who have healthy stock should abstain from visiting diseased stock.

5th. Buckets and other articles used for diseased stock should not be used for anything else unless washed and scalded.

6th. Stock from infected herds should not be shipped to market or moved from the infected grounds, and none should be allowed on highways.

7th. It is prudent to keep sheep, and perhaps swine, away from the infected herds.

8th. Persons with sore or chapped hands should handle disease carefully and wash clean after dressing cases.

It will pay to follow strictly all of these measures of precaution. Some of them may appear unnecessary, but they are all based on rational hygienic principles that should not be transgressed. In bad or complicated cases in which the feet are much affected, a daily wash with a copperas solution will be a great assistance.

Feed: The lips usually become so sore that the cattle cannot pick any food. This is what causes such extreme gauntness and falling in flesh as characterizes the malady. When death occurs it is rarely due to internal lesions, but seems generally caused chiefly by starvation during the fever. To avoid such results feed the stock gruel, and push ears of corn into the mouth directly under the grinders, when the patient will chew and eat them.

Letter Reporting Result of Investigation of this Cattle Disease.

COLUMBIA, MISSOURI, September 15, 1890.

To his Excellency GOV. D. R. FRANCIS, *Jefferson City, Missouri:*

SIR—I beg to report to you the result of further investigations carried on by me in conjunction with Dr. C. B. Michener, Inspector B. A. Industry, respecting the present outbreak of disease among cattle in several counties of the State.

We find by observation and careful inquiries as to the history of the case, that by no possibility can the cases be identical with European foot and mouth disease.

We are also led to believe that this disease is not contagious, but that it is due to like causes or conditions that are now operating quite generally through the State.

The foods, grasses, etc., may probably be affected with some form of fungi that is producing this trouble. This, however, is not definitely ascertained as yet.

We are united upon the following facts:

1. That the disease in question is not foot and mouth disease.
2. That it is not contagious.
3. That there is not the slightest cause for alarm among our stock-owners.

Respectfully,
PAUL PAQUIN,
State Veterinarian.

P. S. I concur in the above report.

C. B. MICHENER,
Inspector Bureau of Animal Industry.

EPIDEMIC MENINGITIS IN HORSES.

The southern counties of the State seem to have all suffered more or less by a form of meningitis that caused a large number of deaths among horses. Our appropriation being exhausted, many individual citizens and assembled citizens have in vain sought to have a thorough investigation made by this department. In some cases, the people even paid some expenses for that purpose. But withal, we had not the means to make as thorough a study of the matter as the case and the welfare of the community demanded, and the people suffered accordingly because of insufficient appropriation. We were forced to prescribe mostly by correspondence on the general nature of the affection. The result was not satisfactory.

HOG CHOLERA.

Our duties have been too numerous to attempt any investigation as to the nature and prevention of this disease. Good work is being made in this line in other States. We have, however, made several experiments with a view to discover a remedy. So far, we have failed. Several tests of the kind are now under way, but the results are not yet at hand. It is a malady that needs close study and many experiments.

STERILITY.

Much is lost to farmers and stock-raisers because of the numerous barren mares and cows. We had studied this question somewhat, and had become convinced that much of the prevailing trouble is curable or preventable. Consequently, after considering numerous inquiries on the subject, we instituted a series of researches and experiments on the subject, the result of which will be known next spring. We found, however, that the great mass of cases are economically curable.

CIRCULAR B.

CIRCULAR CONCERNING TUBERCULOSIS AND BIG-JAW.

COLUMBIA, MO., May 28, 1890.

To the Deputy State Veterinarians and Live-stock Inspectors, State of Missouri:

GENTLEMEN—Whereas, tuberculosis and actinomycosis (consumption and big-jaw) are prevalent in the State and are constantly propagated to the great damage of agriculturists, stock-raisers and the people in general; and

Whereas, both maladies are unquestionably transmissible among stock, and even communicable to man from animals, as was proven by experiments and observations in various countries; and

Whereas, our city and even town markets are served with much meat of such dangerous origin; and

Whereas, it is our duty to investigate conscientiously and thoroughly the maladies in question, protecting at the same time the people of our State;

Now, therefore, I, Paul Paquin, State Veterinarian of Missouri, by authority vested in me by section 8793, Revised Statutes of Missouri, 1889, hereby request that all officers acting as Deputy State Veterinary Surgeons will, under section 8780, Revised Statutes of Missouri, 1889, investigate among cattle all cases or outbreaks of disease that may be thought contagious, infectious or of a spreading character, and whenever actinomycosis or tuberculosis shall be found, the diseased animals shall be completely and effectively separated from all healthy stock until cured or dead, or until found free from danger. Such separation shall be effected with the least possible inconvenience to and by consent of the owner or owners if possible, who in such cases shall sign an agreement to that effect. When the owner or owners or person or persons in charge of such diseased stock shall refuse to enter into any agreement of the kind, then the veterinary officer shall firmly order the same in quarantine under section 8781, Revised Statutes of Missouri, 1889. Medicinal and surgical treatments, when prescribed, shall be done free of charge.

As there is much conflict of opinion among the people concerning the question of transmissibility of both the diseases in question, it is desirable and urgently requested that the fullest and most courteous explanations be given to all the citizens who may be sufferers from such plagues among their stock, and all who may demand information or who may be known to be in need of information.

The live-stock inspectors who are not veterinarians will please report to the State Veterinarian any disease of a suspicious character among stock (aside from Texas fever, to prevent which is their chief duty).

The owner or owners, or person or persons in charge, shall be requested to report the result of treatment or quarantine at least monthly.

Finally, the deputies and inspectors shall keep accurate records of all cases of big-jaw and tuberculosis that may come to their notice, and the treatments prescribed. Make special note of cases found in stock-yards, those sold to butchers, and make reports regularly once a month, if possible, and not less than quarterly, just as for other infectious or contagious diseases.

PAUL PAQUIN,
State Veterinarian.

VARIOUS INSTRUCTIONS TO THE DEPUTY STATE VETERINARIANS AND INSPECTORS.

In order to show the people of the State the spirit with which the veterinarians have always rendered their services, and that they have always aimed to benefit the State as fully as practicable under the law, with the least friction and in the least possible offensive manner, I deem it well to give here a copy of the State Veterinarian's instructions.

And in order that the people may know the accuracy with which we have endeavored to render all our accounts to the Board of Curators, and to keep useful records of the diseases investigated, I give the form of reports which the State Veterinarian thought it wise to adopt for the deputies who are not sworn officers. The State Veterinarian himself is a sworn officer and under bond of $15,000.

CIRCULAR C.

COLUMBIA, June, 1890.

To the Deputy State Veterinary Surgeons and Live-stock Inspectors, State of Missouri:

GENTLEMEN—The duties that you have to fulfill for the protection of live-stock, the interest of the people, and for the protection of the health of the citizens by preventing the communication of animal diseases to them, are very delicate and sometimes painful. You will encounter, as I have for the last five years, some ignorant people who feel competent to advise concerning diseases of stock. You will find parties more or less capricious and difficult to deal with, and a few who will make your labors onerous, but I assure you that you will, in the vast majority of cases, meet people of sound sense, kind and courteous, and who will assist you most heartily. This I have found to be the prevailing nature of Missourians.

But whatever may be the disposition or nature of the people that you will meet in the discharge of your duties, I sincerely hope that you will please bear in mind that we are only the servants of the people of the State, and that in accepting our respective positions, we did so knowing the diversity of characters, notions, etc., and that every citizen of Missouri is entitled to our services under the law governing our offices, and entitled to kind, courteous and always conscientious treatment.

It is alleged by two complainants that there has been too hasty action on the part of two members of the force of the veterinary system on at least two different occasions. On investigation I found the complaints based mostly on misconception of the veterinary law, and on ignorance of veterinary science. But the fact was emphasized that we cannot inform too well the people whom we have to deal with officially, and that we cannot be too prudent and too kind in our actions. Indeed, it is our duty to so conduct ourselves officially.

In order to make the veterinary sanitary system of Missouri as effective, as beneficial, and the least inconvenient possible, I beg leave to submit very respectfully a set of rules that will help those who will respect them, and cause our work to be appreciated in its full measure:

First—The veterinarians shall act only as experts in diagnosing disease, and not as appraisers or butchers of stock.

Second—Any man in doubt as to the correctness of the diagnosis or opinion of an official veterinarian, has a perfect right to call in other experts at his expense, providing that it be done without interference with the law.

Third—In any doubtful case, such as glanders or tuberculosis, for instance, which are sometimes impossible to diagnose after a single visit, urge earnestly the necessity of awaiting further development and making tests. For that purpose, always do all in your power to obtain a written agreement on the part of the owner or party in charge to keep such stock safely separated from any other stock not similarly diseased.

Fourth—Whenever an official veterinarian is satisfied that a disease is contagious, infectious, or even only spreading in character, and of such a nature as to threaten to cause damage to somebody, he may order the stock so affected in quarantine by process of law, if he deems it necessary for the safety of the people's interest.

Fifth—Always explain cheerfully, fully and as clearly as possible any disease that the people may think communicable.

Sixth—Never request the sacrifice of diseased stock with undue haste; but, in certain affections apt to spread largely and quickly in a closely-populated neighborhood, there is scarcely any such thing as undue haste, providing that there be no doubt whatever as to the correctness of the diagnosis, and absolute proof thereof can be furnished.

Seventh—The veterinarians and inspectors should abstain from publishing right and left the diseases found here and there. Such a course injures the parties directly interested, and does nobody good. When one case of glanders is reported, for instance, before the fact has reached New York through the press, it has grown into enormous ciphers, and when it reaches Canada and London it has increased to mountain height, and has the effect of injuring commerce, and thus defeat partly the local benefits of the law. Such things should be reported only officially from headquarters, and in such a way that no misconstruction can be placed on the language by any just people.

I hope that all of the veterinary officers will receive this circular with as good feeling as I write it, and will act accordingly.

In conclusion, I must say that I am bound by justice, my oath of office and my desire to do my employers the most good possible, to employ no man who will act negligently, or without interest in the matter, or who will put his own will above the interests of the State and her citizens. A foot-note will explain whether the recipient of this was complained of or not, and the nature of the complaint. If no foot-note is attached, no complaint is charged against the recipient.

Yours very truly,

PAUL PAQUIN,

Missouri State Veterinarian.

CIRCULAR D.

COLUMBIA, MO., June 26, 1890.

To the Deputy State Veterinarians and Live-Stock Inspectors:

DEAR SIRS—Please report fully, and as far as practicable in tabulation form (on blanks furnished from this office or on similar ones), the official labors that you have performed since January 1, 1890, to the first of July, with dates, etc., State the trips you have made, the number and nature of cases attended to, the treatment prescribed, the results, etc. The inspectors will report on their work on inspection in their respective territories.

This request is made in order that section 8790 of the Revised Statutes of Missouri, concerning reports, may be complied with. Every deputy and inspector will please report within eight days the work done until July 1st.

Very respectfully,

PAUL PAQUIN,

Missouri State Veterinarian.

COPY OF FINANCIAL AND MILEAGE REPORT.

(Under section 8794, Revised Statutes.)

STATE VETERINARY SERVICE.

Financial report to the State Veterinarian, by............................

Deputy State Veterinarian.

18....   ....

Dates.	Official travels and labors.	No. of days.	No of miles.	Expense.

....

County of... ....

State of Missouri.

I, undersigned, Deputy State Veterinary Surgeon of the State of Missouri, do hereby declare, under oath, that the report on this sheet is true and correct, and that the services rendered and expenses incurred as stated therein were necessary for the good of the public and the proper fulfillment of my duties under the Veterinary (Surgeon) act of 1889.

....

Deputy State Veterinarian.

Subscribed and sworn to before me, this ....day of......................, 18....

Witness my hand and official seal. My commission expires..........................

....

Notary Public.

Office at..................................Mo.

NOTE TO THE LEGISLATURE.—These blanks are about fifteen inches long and eight wide, and are sworn on the back in a blank as the above before presentation to the Board of Curators.

[Copy—reduced size.]

Professional Services of Official Character by the State Veterinary Surgeon of Missouri and his Deputies.

18..

Date.	Name of disease.	Characteristic and most prominent symptoms.	Post mortem appearances.	Treat-ment.	Result.

NOTE.—The Deputy State Veterinarians will bear in mind that the law requires them (when on duty) to prescribe free, if they deem best to prescribe at to all, and ascertain thereafter, as far as possible, the result of treatment, whether medicinal or otherwise. Reports in these blanks should be made at least quarterly to the State Veterinarian for his records and reports.

THE VETERINARY SERVICE AND ITS COST.

The State Veterinarian's duties concerning accounts are all comprised in five lines of section 8794, Revised Statutes, 1889: "Said veterinaay surgeon shall render account to said Board of Curators for the number of miles traveled by himself, deputies or inspectors, the help employed and the cost thereof, and all the incidental expenses incurred in working under the law; said account or accounts shall be audited, and, if found correct, shall be allowed as now provided by law."

Under this section, the State Veterinarian did render his accounts, as may be seen by the certificate hereafter presented, and I presume also from the report of the Board of Curators of the State University. From the records I find that the total number of miles traveled for all purposes under the veterinary law since the middle of the summer of 1889, July 1, when it was pronounced constitutional, to December 31, 1890, is 49,264; grand total of all diseases attended in every way, 7,349; grand total of letters received and written as State Veterinarian in 1889-90, 15,330.

The total cost of such travels and of the laboratory expenditures and all forms of incidental expenses, the salary of inspectors, deputies and clerk, as appear per bills presented in 1889 and to the end of 1890 is	$11,672 26
The total amount paid thereon	9,795 66
[*] Balance due the veterinary office by the State	$1,876 60

The help employed by the State Veterinary Surgeon under section 8793 is as follows:

Deputy State Veterinarians:
- Dr. T. E. White, Sedalia, Mo.
- Dr. H. B. Adair, Kansas City, Mo.
- Dr. A. Rouif, St. Louis, Mo.
- Dr. Jno. Meyers, St. Joseph, Mo.
- Dr. J. W. Connoway, Columbia, Mo.
- Dr. F. W. O'Brien, Hannibal, Mo.
- Dr. T. J. Turner, Mexico, Mo.

These men were paid only when on duty: *i. e.* when the State Veterinarian was too pressed, contagious diseases existed in their neighborhood, or when the State Veterinarian could not suffice even nearer home. It will be observed that the greater the number of men the cheaper was the service, because it saved much travel, and no man is entitled to a dollar when not engaged officially. Then he was paid under section 8794 at the rate of $5.00 per diem. Several deputies have signified their intention to resign unless we can pay them more, because they claim, and justly too, that occasional trips, once a week or less, only break into their practice, make them lose customers, and ruin their regular established practice.

The following were appointed as inspectors to enforce Governor Francis' proclamation concerning Texas fever:

Mr. Joseph Bruser, Kansas City stock-yards. Salary, $100 per month, half of which was paid by the stock-yards.

Col. John Finn, St. Louis stock-yards and St. Louis city. Salary, $125. Resigned after one month.

*Dr. Jno. W. Connoway, St. Louis, Mo., succeeded Col. Finn, but with the powers of a deputy veterinarian. Salary, $100.

Mr. M. P. Parker, inspector at large for railroad disinfection and small yards scattered, such as Hannibal. Salary, $100 per month.

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[*] This balance is the result of the accounts as presented to the last of 1890. It does not include the remainder of the bills (which have been presented since), to the amount of about $50, nor the cattle used in experiments as stated elsewhere. These cost $400. Thus it will take $2,326 60 to pay all bills still due for 1890, including the cattle.

*Dr. Jno. Myers, at St. Joseph. Salary, $5.00 per week—his duty being to make two weekly trips to the St. Joseph yards some distance out of town.

All of these men were dismissed in August because of our low finances, and then Mr. Bruser at Kansas City was generously paid until the end of the quarantine season by the superintendent of the stock-yards, Mr. H. P. Childs.

In St. Louis, after the exhaustion of funds, Dr. Rouif made weekly or bi-weekly visits to the various stock-yards, and kept things in order under his commission as Deputy State Veterinarian. Dr. Myers did the same thing at St. Joseph.

There is no question that this inspection had a wholesome effect on shippers, and prevented greatly the indiscriminate scattering of infectious cattle, and to some degree the distribution of fever by railroads.

For instance, Mr. Bruser alone inspected 56,499 cattle originally from some Southern districts, and discriminately allowed their shipment through or to points within the State only under the regulations, or in some cases kept them in quarantine until such time as Northern stock would be safe in contact with them.

Mr. John Holmes, of St. Louis, also acted as agent for a short time to reach cases of glanders in that city. There being no county court, nor any true "substitute thereof," in St. Louis, quarantine can scarcely be enforced after the State Veterinarian has served his official notice. Mr. Holmes brought such cases within the jurisdiction of the Humane society. There is absolute need of reform on this point.

Copy of Certificate of J. G. Babb, Proctor Missouri State University, concerning the Accounts of the State Veterinarian.

I, the undersigned, J. G. Babb, Secretary of the Board of Curators of the Missouri State University, hereby certify that the accounts of the State veterinary service have been duly presented according to section 8794, Revised Statutes, since the new law came into effect in 1889, the total to date amounting to $11,672.26, and that of the full amount of appropriation, to wit, $14,000 for 1889 and 1890, the sum of $9,795.66 has been expended in payment of said accounts under the section mentioned, and that there remain unpaid at this office, at this date, bills of the same nature to the amount of $1,876.60.

All the accounts paid were audited and found correct, and the balance remaining unpaid is for services of the State Veterinarian and deputies, and for expenses of investigations of the same kind as has been done regularly under the law.

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*Drs. Connoway and Myers are both deputies mentioned in the first list, and who acted as inspectors for the time being.

The appropriation of $14,000 for two years was divided into two funds by th State Auditor, and the expenses of 1890 amounted to $1,876.60 more than the $7,00 allotted to this year, whilst the expenditures of 1889 were only $2,795.66, owing principally to the fact that the veterinary law became in force late in the year.

(Signed) J. G. BABB,
Secretary Board of Curators.

The original certificate was sent to Governor Francis, and a signed copy may be attached to the report of the Board of Curators. This is only a copy signed by me. This certificate refers to bills in the hands of the secretary the last of 1890. It does not include money due the Veterinarian for experimental cattle and other small bills presented later, as already stated.

INSUFFICIENCY OF THE LAST APPROPRIATION.

It will be seen from the foregoing that the appropriation of $7,000 for the year 1890 was exceeded by the necessary expenditures of the veterinary service, within the meaning of the law, to the amount of $1,876.60. At the time the balance sheet was made, at the end of 1890, small bills to the amount of about $50 had not yet been received.

This is to say that the State Veterinarian and his deputies rendered certain official services, paid their own traveling expenses, and continued their investigations of animal diseases, for the good of stock-owners, under the veterinary act, and have not yet been reimbursed, and that some incidental expenses yet remain unpaid. (And this does not include twenty head of cattle, costing $400, which we purchased and used in experiments.)

It may be observed that the official work should have been entirely stopped when all the money had been expended. It was not entirely stopped—

First—Because it was utterly impossible for a great portion of the work to be stopped. The correspondence was increased rather than diminished, and this, with telegraph calls at the State Veterinarian's expense, which could not be forestalled, required, as usual, a clerk right along and continual unavoidable disbursements. Express charges for specimens sent for investigation of diseases had to be met as usual.

Second—The work was very pressing and demanded by the people, and some of the deputies were in the field constantly, unable to make regular reports, and when the exhaustion of funds occured they could not at once get home to their books and make their reports under the regulations. Hence, some have traveled officially for thousands of miles at their own expense, and are out of pocket for this, and their salary besides.

Third—We thought the veterinary office entitled to the surplus of the $7,000 of veterinary appropriation set apart for 1889, and which was left unexpended in that year, for in reality it was, after all, a portion of the total of $14,000 veterinary appropriation for the last two years, to wit, 1889 and 1890. But the language of the appropriation act, which was unfortunately omitted from the Revised Statutes, and which, therefore, we had not to guide ourselves, was, on request, examined and so construed by the State Auditor as to debar us from the use of that surplus.

Fourth—Our experiments and investigations in Texas fever, big-jaw, etc., a synopsis of which appears in the foregoing pages of this report, could not be suddenly dropped without jeopardizing the pending results and losing the greater portion of what had already been secured in this line for the benefit of the people.

Fifth—The expenditure for 1890 was greater than that of 1889, because of the inauguration of the system of quarantine regulations by the accompanying proclamation of Governor Francis, to prevent the introduction of Texas fever in Missouri, and which was, for a first attempt, very successful, and saved the country thousands of dollars, as may be seen in the chapter headed "Texas Fever." So the State owes the veterinary office the sum of $1,876.60, as may be seen by the balance sheet in these pages, plus $400 for experimental cattle, and about $50 of bills presented since making the above.

We sincerely hope that the General Assembly will make an appropriation covering this amount, for otherwise the State Veterinarian and his deputies will be losers individually.

And besides, to enforce such effective quarantine regulations as were inaugurated under his Excellency Governor Francis, it is absolutely necessary that an appropriation of between $14,000 and $15,000 a year be made in lieu of $7,000 a year.

Under the heading "recommendation," made under the law, will be found a detailed explanation of the needs of the veterinary sanitary system. But it may not be amiss to say here, too, that a betttr laboratory building is necessary for the production of the greatest good; that the many contagious, infectious and spreading diseases of animals may be safely combated only with a sufficient force of men; that the work becomes better known daily and as a consequence increases constantly, the people calling more and more for aid from every quarter in their trouble with all kinds of maladies; that many epidemics of serious character, such as swine diseases, for instance, can scarcely be attended to for want of a sufficient force and time; that we could attend to all demands satisfactorily to the great benefit of the people if backed by an appropriation sufficiently large for all emergencies.

RECOMMENDATIONS TO THE THIRTY-SIXTH GENERAL ASSEMBLY.

In our work we found the veterinary law almost inoperative in St. Louis. There being no county court in that city to take charge of quarantined stock, nor "any substitute thereof," as the law presumes, we had much trouble to deal with glanders, some ill-disposed men even going so far as to take advantage of technicalities to arrest and imprison a deputy State veterinarian, and subject him to indignities, because he reported a case of glanders to the Humane society, whose officer saw fit to destroy.

The behavior may have been not pleasant under the circumstances on the part of the deputy and the Humane society officer, but it shows the more that a court of St. Louis, say the court of criminal correction, ought to be specified in sections 8781, 8782 and 8783 of the Revised Statutes of 1889, and thus give protection and strength to the St. Louis veterinary sanitary officers in matters of quarantine.

In view of the decision of the Board of Curators of the Missouri State University and the State Board of Agriculture to place the State veterinary service, *i. e.*, the field work, under the State Board of Agriculture, it will be necessary to change several sections of the veterinary law.

We have noticed early that when the appraisers are named by the county courts to appraise glandered stock to be killed under section 8783, they almost invariably appraise too high. We endeavored to prevent that by issuing a printed letter as follows, but it seems to have been in vain:

To the Honorable Judges of the County Courts of the State of Missouri:

In view of the difficulties (due to a lack of knowledge in veterinary science) in the way of appraisers of stock quarantined under the veterinary surgeon act, I beg to state that in glanders and farcy, cases reported to the county courts by the State Veterinarian or his deputies, as "acute glanders (or farcy)," are liable to die very soon and are worthless to work, and have, consequently, a very minimum, if any value; cases reported as "sub-acute" are capable of some service as a rule, but are really worth very little; finally, cases reported as "chronic" can render fair service, and may last months and even years in favorable conditions; these have, therefore, more value than the others.

According to the law, the appraisement must always be with consideration of the disease, and parties are not entitled to it who have gotten their stock already diseased as reported, or who have brought it diseased from outside of Missouri, or who are responsible for the disease through willful neglect, scheming or inhuman treatment, etc. See sections 8 and 9, veterinary surgeon act of 1889; section 8783, Revised Statutes 1879.

Very respectfully,
PAUL PAQUIN,
State Veterinarian.

COLUMBIA, MO., October 14, 1889.

I would recommend, therefore, that cases of glanders reported to the county courts under the designation of "acute" be killed without compensation, or a maximum of five dollars to pay for burying the carcass; that cases reported as "sub-acute" never be paid more than $25; that cases reported as "chronic" be never paid more than $50; and in other maladies mentioned in said section, in which indemnity may be claimed, that no appraisement shall exceed $50 or $75. Or perhaps some other better means may be devised to reach the case. It was suggested to me also that each county "foot its own bills" in paying indemnities for diseased stock that may be destroyed under the law.

This is a legal matter upon which I am not competent to speak. If feasible, I believe it would be the most equitable. If such a scheme should be inaugurated, it will be well to remember the peculiar position of St. Louis, which has no county court, and not to again leave her out.

ESTIMATE OF MONEY NEEDED

For the whole veterinary sanitary service for 1891-1892, exclusive of the indemnity fund:

Salary of State Veterinarian, two years	$5,000
Salaries of deputies and clerk, two years	6,700
Four inspectors and agents to enforce Texas fever quarantine nine months each year for two seasons at $100 per month	7,200
Traveling expenses of veterinarians and inspectors, two years	5,000
Drugs, chemicals and laboratory expenses and aid for investigation of diseases, two years	5,000
Stationery, stamps, telegraph and express	600
Total	$29,500

This estimate is based on the work done in 1890, the work left undone because of slim appropriation, and the gradually increasing demand on the veterinary office.

I would recommend that the appropriation be made in one sum for two years, as the Governor himself recommended; so that, should any emergency arise, the money may be drawn upon at any time by the proper authorities.

I attach an appendix under the title of Circular B. This circular letter explains the grounds we took when we began to treat consumption and big-jaw officially as dangerous diseases.

Very respectfully submitted.

PAUL PAQUIN,
State Veterinarian.

ANIMAL DISEASES.

BY PAUL PAQUIN, M. D. V. S., STATE VETERINARIAN.

The law governing the State Veterinarian is obviously intended to cover only contagious, infectious or spreading diseases, and yet the language in certain sections, with reference to investigation of animal maladies, seems to contemplate inquiries on the subject of affections of stock in general. But nowhere is there to be found an indication that the State Veterinarian, with his constantly growing and always difficult and complicated duties, should take several hours of time a day belonging to the State, for the purpose of replying to a continual flood of letters written by citizens for their individual benefit. Still, the people who are situated at a remote distance from any competent veterinarian are so often helpless in a moment of danger to their stock, that I have always done all in my power to assist them, whilst adhering as closely as possible to the rules of my superiors and the mandates of the law. It is impossible to explain fully to every man who inquires what ails his stock; I have no right to use State funds or State time for such purposes, if the replies shall be for individual good, such as in cases that are neither of a contagious, infectious nor spreading character.

For the purpose, therefore, of rendering as much help as possible to the whole State on such matters that I cannot take cognizance of officially, but which nevertheless cause much damage to stock-owners, I have arranged, by request of the Secretary of the State Board of Agriculture, to write a series of articles for the Board's monthly reports. I do not intend to compete with competent veterinary practitioners, nor to make every man his own "horse doctor." A man indeed is more able to treat diseases in his fellow-beings, who can speak and explain their pains, than to treat diseases of dumb brutes. But I shall endeavor to enlighten stock-owners on various maladies, so that they may prevent them in a large measure, and if need be, when no aid is to be had from a competent source, treat them humanely and intelligently.

In the first place, I desire to impress on every reader's mind that prevention is the object to strive for, and that fully two-thirds of the ordinary diseases of stock are such as could be avoided by ordinary prudence and care, based on the knowledge of the most important physiological functions of animals. This knowledge, then, is the first hing we should endeavor to impart, to some extent at least. Consequently the people will understand better each disease to be studied y prefacing such studies with a few remarks on the healthy conditions f the parts attacked. If my readers will honor me by following these rticles, I think they will be found to contain some points of value.

ARTICLE I.

GENERAL ORGANIZATION OF THE BODY.

The basis of knowledge of maladies rests on the knowledge of the organs which become affected. We will give an outline of them.

The body is composed of eight sets of apparatus or systems, viz.: Locomotive, Digestive, Circulative, Respirative, Urinary depurative, Generative, Nervous and Sensory. All of the apparatus or systems are in the turn composed of organs thus:

Locomotive: Bones and muscles. Its functions are to produce locomotion.

Digestive: Mouth, gullet (or œsophagus), stomach, bowels, liver, spleen, pancreas. The functions of this system are eating, digesting, assimilating food to nourish the body, and casting away solid material unfit for nourishment.

Circulative: Composed of blood vessels (arteries and veins), and lymphatic vessels (lymph or white blood-veins).

Respirative: Composed of nostrils, wind-pipe (trachea), bronchial tubes, lungs.

Urinary Depurative: Composed of the kidneys, ducts from kidneys to the bladder (ureters), the bladder, and urethra or opening from the bladder to the exterior.

Generative: Male and female organs of reproduction.

Nervous: Composed of the brains, spinal cord and all the nerves.

Sensory: Composed of the organs of senses, such as the ears, eyes, nose, palate, tongue.

In our next we will begin with diseases of the locomotive apparatus.

ARTICLE II.

DISEASES OF THE LOCOMOTIVE APPARATUS.

PART I.

COMPOSITION OF THE LOCOMOTIVE APPARATUS.

The bones as a whole constitute the frame of the body; the bones individually act mostly as levers. They are moved by the contraction of the muscles attached to them. The contraction results mostly from will power under the influence of the brain and nervous system. The bones are kept together at the joints by means of little bands termed ligaments. There are several such ligaments to each joint. Besides this, the joints are covered by a capsule so attached to the extremities of the bones as to form a kind of sack all around, in which is secreted the joint oil (or synovia), the object of which is to lubricate the articular surfaces. This oil is essential to good, painless motion. If it oozes out through a wound, it seriously impairs the articulation.

The muscles are attached from bone to bone by rounded or flat extremities of a white, gristly nature. These extremities are termed tendons or cords.

Blood vessels, lymphatic vessels and nerves supply all these parts, as will be seen in another article.

PART II.

LAMENESS.

Lameness is a defect in locomotion, *i. e.* an irregular, unnatural gait. It may show itself in one or more limbs, and sometimes it proceeds from the back (spinal column), and even from other parts, as disease of the liver, for instance.

The immediate producer of lameness is the inability to sustain weight and move, and this inability comes from injury of organic or functional character.

It is apparent from the above explanation that there must a great variety of lameness.

Causes: They are predisposing and specific.

The predisposing causes are as follows: Condition of the extremities (feet), condition of the roads, kind of work, immaturity of age, shoeing and heredity.

The specific causes are the various diseases of the locomotive apparatus, and a few other organs, causing indirect interference on this apparatus.

Diagnosis: It is frequently very difficult to detect the seat of a disease producing lameness. The best of practitioners are often baffled for a long time when nothing is visible or perceptible to guide them. As a result, there are many wise men who guess and unmercifully torture poor brutes by cruel blistering or firing from head to foot.

The first thing in order when a case of lameness is present is to detect the lame limb. After this the exact locality may be searched for.

It is necessary, as a rule, to examine a subject under three conditions, viz.: at rest, in motion, and immediately after moving. It is sometimes useful also to move the animal over both soft and hard roads or ground. A horse lame in the foot is usually worse on hard roads than on soft ground. If lame in the shoulder or hip it is generally the reverse. When lameness is in the fore quarters, the movements of the foot and the head occur in unison: *i. e.*, when the lame foot is raised the head raises with it, and when the sound limb is brought down to the ground, the head drops also.

In lameness of the hind quarters the haunch settles downward when the sound limb touches the ground, whilst the head drops when the diseased one is brought to rest.

In a word the weight is thrown on the sound limbs, consequently if a subject drops to the right he is lame on the left, if he drops to the left he is lame on the right side.

Prevention: A great number of lamenesses are due to such causes as might be prevented by judicious management.

I will mention first: *Shoeing,* which in the majority of cases is badly done—the foot being cut, burned and rasped to fit a badly made shoe, instead of making a good shoe to fit the foot. The horse's hoofs should be shod at least monthly, and trimmed around the edges just about as much as a month's wear would have done in an idle animal roaming at will in pasture. It takes experience, observation and judgment to understand this point well and to practice accordingly.

The frog should never be touched. It is a natural elastic cushion that prevents concussions and contractions. It should be allowed, even with a shoe, to rest squarely on the ground.

Second: Hereditary predisposition and transmission—In this class of preventable causes may be found ringbones, spavins, curbs, splints and various bony tumors about the articulation, etc. Don't breed from animals so blemished.

Third: Tender age, such as working colts too severely at two years. A horse should be three years old before he is worked or ridden much. Before that age the bones, ligaments and tendons are too imperfect, tender and weak.

Fourth: Accidental injuries due to careless driving, riding, or to neglect in repairing barns, fences, vehicles, harnesses, etc. etc., and in new constructions.

PART III.

SPECIAL CASES AND THEIR TREATMENT.

Note: I will confine myself chiefly to such maladies as may be successfully treated without the aid of an expert. But my object being to benefit those who are remote from expert veterinarians, I will touch even on difficult cases. In prescribing I will, as much as practicable, make use of home remedies—many of which are as good as more costly drugs. I will not hesitate either to prescribe any of the proprietary remedies which have been proven efficacious, such as anti-pyrine, katharmon, petrolene compound, etc., etc.

It must not be inferred, however, that I advocate the indiscriminate use of patent "cure-alls." This class of medicine is unsafe and unreliable.

And, by the way, never prescribe, of your own accord, anything for any disease when you know nothing of the remedy (and perhaps nothing of the disease either). Nature is safer alone in such cases.

And again, when you get a prescription from a competent source, allow no substitute therefor, or for any part thereof. Some druggists are apt to substitute when they happen not to have in stock the drugs called for. A horse should have the very best of any kind of drug prescribed, and the druggist should call on his wholesale house if he is not stocked to fill your prescriptions. If you value your sick stock, insist on all this.

A cheap trash is too dear at any price, and a costly quack nostrum is an imposition ten times out of twelve.

SCRATCHES, GREASE, CRACKED HEELS, LEG SORES IN JACKS, ETC.

There is a variety of skin diseases about the limbs which from a practical standpoint have a common interest. As space is too limited, we will treat them under a common heading.

They consist in irritations, inflammations, swellings, and even fungus growths (proud flesh), affecting the skin more or less deeply.

Some present cracks crosswise of the pastern joints; others scaly scratches all around the fetlock joint, etc.; others greasy, ill-looking surfaces with a secretion of more or less offensive matter; others have sores of a similar order in various parts of the limbs—occasionally presenting excrescences, proud flesh growths.

Treatment: In severe cases, such as present heat, pain or swelling, or in long-standing cases, apply during three or four days a warm linseed meal poultice twice a day—taking one-half to one pound of linseed meal for each poultice, and making a soft paste with warm water. Apply around the sore in something like a strong canvas or leather stocking held in position by flat bands, loosely tied around the leg, and not by cords tied so as to make creases in the skin. After this, wash clean and wipe dry, and then apply twice daily with the hand some tarro-petrolene (veterinary), pure, or incorporated thoroughly with boracic acid in the following proportions: tarro-petrolene, 4 ounces; boracic acid, 4 drahms. If the case is slow in healing, give internally some Fowler's solution of arsenic at the dose of one tablespoonful twice a day in water, feed, milk, or as a drench. Avoid mud, wet weather, dew, manure piles, filthy stables, and all irritants of the skin.

WOUNDS OF THE FLESH, TENDONS, BONES, ETC.

All these cases, which cause more or less lameness, have also a common interest from a practical standpoint, but the treatment may vary according to the location and extent of the wound.

In simple flesh wounds or tear of muscle, little if any, treatment is necessary besides cleanliness. This is absolutely necessary to favor sound granulation and prevent blood poison.

In some wounds, particularly cut wounds of the limbs, there is frequently severe bleeding. This can be stopped in most cases by twisting a rope tightly around the limb above the wound, in order to close the arteries through which the heart blood is poured out. While in this condition the wound should be bandaged tight, using a compress on the cut itself, a good wad of cotton—raw cotton or batting cotton. Some perchloride of iron may be sprinkled on this first if any is at hand; if not, the wound may be bathed beneficially with cold water before bandaging. In serious bleeding, I found it useful in an emergency to powder the wad of cotton with flour. The bandage should consist of cloth—cotton cloth preferred—wrapped tightly round and round and finally fastened safely. After bandaging, remove the rope that has been tightened around the limb. Twenty-four or forty-eight hours later remove the bandage, cleanse the wound by bathing with warm water without rubbing, sponge dry and dust over with iodoform powder, or apply the boracic acid and tarro-petrolene preparation given above for scratches and the like. This has the advantage of keeping the flies away, including screw-worm flies, and preventing the formation of dry crusts under which proud flesh so often grows. Irregular wounds need not be stitched as a rule. The only occasion for stitching a wound in an animal is when there is a large gap or flap with edges that can be drawn well together, and when there is reason to hope for a cure without a mark, or when the closing will prevent the access of outside influences to important organs, such as wounds in the belly. All dirt should be scrupulously removed before stitching, and iodoform used to cover the place. It is idle for any one to stitch who is not familiar with the principles involved. An elegant dressing for wounds and sores in general (for man and beast, by the way), is the following, which could be kept always ready:

Boracic acid, two drachms; iodoform powder, one drachm; tarro-petrolene, four ounces.

This is antiseptic and highly healing. The tarro-petrolene contains sufficient pine tar and petroleum to keep flies away and favor healthy granulation and prevent blood poison.

Wounds of the bones and tendons, exclusive of fractures and ruptures, are treated similarly.

The latter two kinds of injury need the services of a skillful surgeon.

As to wounds of the joints, such as caused by pitchforks, or kicks resulting in open joints, most of them also need a surgeon. But often a valuable horse is ruined unless something is quickly and well done. It is difficult for an ordinary observer to tell the thick joint oil (synovia) from pus; therefore it is always best, when a proprietor finds matter oozing from a joint, not to apply the knife, but to bathe for an hour in cold water, and then apply a blister of a kind that will cause swelling, and not simply a caustic as an acid, mercury, etc.

A very excellent preparation is blisterine, a blister better prepared than can be compounded in the average drug-store for veterinary purposes. It is applied once every four, six or eight days by rubbing ten minutes at a time all over around the wounded joint, including the sore that discharges. Such a blister as recommended further for sprains will do.

Keep animal perfectly idle, and grease the blistered place occasionally, beginning forty-eight hours after the blistering, until the next application.

The subsequent blisters should be applied after the effects of the preceding one are healed.

Before blistering, the hair should be cut close with scissors or shears.

SPRAINS.

This word means a disease of the muscles, tendons or ligaments resulting from over-exertion, excessive straining, sudden jerks, wrong stepping, etc., causing the stretching or tearing of the tissues constituting those parts. Sprains may therefore occur at any part, but they are more common about the joints, long muscles and tendons. They may be so slight as to cause a lameness barely perceptible or no lameness at all, or they may be so severe as to produce the most painful inflammation, with consequent swelling, thickness, and occasionally a permanent enlargement.

Judging from the causes above enumerated, it is evident that the lameness from a sprain appears suddenly: *i. e.*, growing sufficiently intense to be perceptible within a few minutes to a few hours after the cause (exertion) has acted.

Treatment.—On the outset pour a continuous stream of cold water or warm water (not simply tepid) on the parts affected for one hour at a time, three or four times a day. When the heat has subsided, rub in thoroughly some stimulating liniment, such as compound mustard liniment, which contains camphor, or arnica tincture with camphor. It can be purchased already prepared.

In cases rebellious to treatment or of long standing, or chronic enlargement from sprain, apply strong blisters containing no acid. Fly blisters for instance, composed of one drachm of cantharides, one drachm of spts. turpentine to one ounce of cosmoline or lard, or, which is far better, apply blisterine weekly as directed on the box.

Some bad cases cannot be cured without an operation called firing, which only competent veterinarians should be allowed to perform.

Sprains are most common about the pastern joints, the shoulders and the tendons (cords) below the knees and hocks. Very many cases are such as only veterinary surgeons can detect or diagnose accurately and treat properly. When one is at hand, better call for him.

BONE TUMORS.

Under this heading I will include spavins, ringbones, splints and curbs, the most common affections of the kind.

These diseases result from inflammation of the parts affected caused by injuries, such as kicks, sprains, over-exertion, open joints, blows, etc., and seemingly from the influences of heredity. A bony growth begins on the bones in the inflamed region, or the hereditary weak parts. Sometimes they occur within the articulation, where it is frequently impossible to detect them.

A spavin is a bone tumor (not a soft one), located usually inside and at the base of the hock-joint, but similar growths may occur anywhere about this articulation.

Note.—A blood spavin or thorough-pin is a distention of the lining membranes (synovial sac) in the joint and causes no lameness, except when inflammation causes a gristly formation therein. Then it may be treated as a bone spavin.

Ringbones occur on or around some of the articulations about the foot, usually near the hoof.

Splints grow (mostly inside) on the cannon bones, *i. e.,* on the long bones below knees and hocks. The little so-called splint bones following on each side of these cannon bones are usually involved.

Curbs appear behind and below the point of the hock-joint, and form a curve by their prominence.

Spavin and ringbones are most difficult to cure. Usually, though, if taken early, and the case is not hereditary, the tumor may be somewhat reduced, if not totally so. The lameness, however, can generally be stopped by proper treatment.

Splints are next in order in difficulty of treatment.

Curbs, if not hereditary, are more easily managed and often radically cured.

Treatment.—First, hot fomentations or bathing as for sprains for several days. Then blister weekly with some good mercurial iodine and cantharides preparation. Or which is preferable in my experience, use the blisterine already mentioned according to directions given. It stops lameness in many cases.

If such treatment fails, firing should be practiced by a graduate veterinarian.

ARTICLE III.

RINGBONES, SPAVINS, SPLINTS, CURBS AND OTHER BONY OR CARTILAGENOUS TUMORS.

The above names have passed to us from empirical works and have little significance in themselves; they are retained, however, in new works to a large extent and are thus known by the people. Therefore we will study them under this popular heading.

Ringbones, spavins, splints and curbs are osseous or bony tumors resulting from local accidental inflammation or hereditary predisposition; a curb, however, is sometimes only cartilagenous, instead of *always* being bony like the others. These diseases being in some sense hereditary, mares or stallions affected thereby should not be used as breeders.

The tumors consist of bony deposits (or tissue) within a joint as occult spavin, or on the surface of bones and edges of joint bones. As the disease progresses the tumor extends on the bones and becomes more prominent; soon it may interfere with the movements of the individual bones forming an articulation. Thus the ringbone, which may occur anywhere from the hoof to the first long bones of the legs, may interfere only slightly with the nearest joint, or may grow all around it in the form of a ring (hence ringbone), which causes serious lameness.

The spavin, which usually occurs at the base of the hock joints inside, may grow at various points of these articulations inside and outside, and impede more or less their motions.

The curb, which grows behind the hock joint below the so-called point of the hock, may affect only the tendon (cord) and its sheath, or also the bones beneath; so it may be partly cartilagenous and partly bony.

The splints are small bony tumors growing on the long bones (shanks), usually on the fore legs and inside of them. They usually appear between the main long bones and the side (or splint) bones, below the knees or hocks.

The spavins, and all bony tumors growing within a joint (such as occult or hidden spavins), are very difficult to diagnose, and very frequently go unrecognized.

The treatment of all of these bony diseases depends on the causation, age of the patient, age of the tumor, its extent, position, etc. A hereditary bony tumor is scarcely ever curable in any sense. An accidental bony growth may be cured and sometimes caused to disappear if taken at the outset. The lameness is generally curable at an early date in most of cases, irrespective of cause. A long-standing bony tumor of any character is rarely made to disappear, but the lameness is occasionally curable.

Ringbones and spavins are at best difficult things to treat successfully, but splints and curbs are more easily treated, with fairly good results. It is a recognized fact that more or less severe counter-irritation will accomplish more good than any and all other treatments in such cases, particularly if the inflammation (heat in the diseased spot) is made to disappear by long, hot fomentations, or very cold and long bathing. The counter-irritants used chiefly are bi-iodide of mercury, cantharides, ammonia or turpentine. The preparation and strength of such blisters depend on the age and nature of the affection, and one prescription can scarcely apply in all cases. Still there is a new preparation in the market that acts admirably in the vast majority of cases, particularly in curing lameness resulting therefrom. It is known as blisterine and combines the active principles of some powerful irritants and absorbents above named. It may even replace the actual cautery (fire as applied by surgeons) in certain cases. But in all lameness it will pay to call in, not a quack or would-be expert, but a graduate veterinarian of good repute, to prescribe according to the nature of the case.

TUBERCULOSIS.

A paper by Dr. T. J. Turner, Mexico, Mo., and read at Farmers' Institutes held by the Board of Agriculture.

Gentlemen: Having been asked by the Secretary of the State Board of Agriculture to furnish a paper, or give a talk before some of the meetings, I have presumed that I might be able to do so, and possibly occupy the time while preparations are being made for a paper of more moment. Having thus presumed, I take the liberty to present to you this subject, Tuberculosis, more especially from a sanitary point of view.

This disease, now prevalent in our country, has for synonyms, consumption, grapes, wasting, scrofula, and as applied by stockmen to feeding cattle, quinines, and various other locally applied names. This is more commonly noticed, probably, in the bovine breed than in any other of the lower animals. Rabbits, dogs, cats, pigs, and in fact all are, however, susceptible to this most fatal trouble. The horse is, probably, less often affected than any of the rest.

This is a specific infectious and contagious disease, due to a certain germ, receiving its name from that of its discoverer (Dr. Koch), "The Bacillus of Koch." Communicable from man to beast and beast to man, at once classes it, on account of its fatality, when once it has gained entrance into the animal economy, as one of the most dreaded diseases with which animals, higher or lower, are afflicted.

I shall not endeavor to give in full, or scarcely in a meager manner, the symptoms of this disease, for there is scarcely a person present, I dare say, who has not been able to see this malady as it is fearfully manifest in man or beast, and probably both. Rather shall I endeavor to point out to you the danger the presence of this trouble may cause to your herd of cattle or swine, your flock of chickens, or who knows, perhaps to the members of your own household. In order to more fully accomplish this, we had best look at the means of its transmission —first, from one animal to another of the same class, then to those of different classes, and finally from animal to man.

We may first state, then, it is transmissible through heredity. Is this doubted? 'Tis said so to be by some; I, however, must, until evidence is positive, still cling to the belief of my early training. This germ is said by some to be obtained by means of or through the use of the milk instead of through heredity. 'Tis true that it may be obtained through the milk, but not in heredity's stead, for they are separate and distinct methods of its transmission. Mate a diseased male to a perfectly sound female, obtain a calf, feed it on its mother's milk, it develops consumption. If it be not hereditary, from what source came such disease? Not from the mother's milk certainly, for she is healthy in all respects; it must then be hereditary.

This being the case, what must be done? You have a very fine Short-horn cow, which probably cost you a great deal of money; she manifests symptoms of scrofula, such as the enlargement of the submaxillary glands, and so lives on, and seems to keep in tolerably good flesh; at any rate, she holds her own. Again I ask, what must you do with her? I fancy I can hear quite a number say, continue breeding her, and get as many calves as possible, thus enabling you to realize the amount invested in her. Is that proper? Some may say, "of course," but I say emphatically, no. Do you by thus doing get your money out of the cow? I should say, rather, every time you secure a calf from her, you get deeper and deeper into the mire, from the fact that to every calf that cow drops, to it she imparts consumption direct or a great tendency thereto.

I can now recall a case that came under my observation some few years ago; 'twas that of a Short horn cow. She was purchased by her then present owner, and to all appearances was for a year or so perfectly healthy, bearing calves every year for three or four years. About the time her oldest calf, a heifer, was three years old, she was stinted and became pregnant; she did not, however, carry her calf to time, but aborted. Shortly after, some three or four months, the three-year-old cow was noticed as affected with scrofula, and some tuberculous abcesses had to be opened about the throat to prevent suffocation; this cow still lives, and, though at times cows thus affected become sterile, she raises calves. Her dam, however, gave evidence of this disease about one year or six months after the heifer did, and is now dead.

I might state here also that it has been thought by many that Jerseys are oftener affected with this disease than any other breed of cattle; yet I do not give this full credence, from the fact that in my experience Short-horns have been equally as often affected. Thus you see by continued breeding of such animals you may infect your whole herd. You should destroy the cow as soon as the disease is manifest, not by fattening her and sending her to the butcher, for at times animals in the quiescent stage of this disease will accumulate fat rapidly, but by complete destruction of the animal.

I may, however, be opposed by some who maintain that the meat of tuberculous animals, when the disease has not made very marked inroads upon the system, may be partaken of as food. Even granting we may partake of it, we must bear in mind that the meat must be particularly well cooked, not warmed through simply, and yet not only well done, but must even be heated to several hundred degrees before this giant bacillus will succumb to its influence. Then, again, we must bear in mind that few are the cooks who will cook meat in that way without being constantly watched. No, I must insist, that so long as meat is so plentiful in this country, we must not partake of it in any way affected. This idea of eating meat from tuberculous animals, in a slight degree affected, may be correct, but as for myself I would rather be excused from using it.

Then, having determined we want no more calves from the cow on account of her imparting the disease or the diathesis direct to her offspring, we look for another reason why she should be destroyed. The disease being infectious and contagious, we lay liable all the rest of our herd, and as colds, sore throat and such like affections but furnish fit soil for the growth of these germs, we had for this reason also better destroy the animal, thus forever closing the door against the enemy. We admit it does at times seem hard to destroy an animal representing so much money, but 'tis far easier to do this now than by keeping her to run the risk of losing the entire herd.

This disease is rather latent at times and hard to detect, but 'tis a good rule to follow, in buying, never to buy a male or female of the stilty race-horse appearance, long-legged or narrow-chested. You may, however, adhere strictly to this rule, and yet buy a tuberculous animal when the disease is latent to break out in all its fearfulness, upon the appearance of a simple cold as the exciting cause. I speak of cattle here most exclusively, from the fact that they are probably the oftenest seen by you, and certainly oftener come under my own observation.

As to its transmission from one class to another, we will cite that of from cattle to swine, as hogs follow cattle in the course of feeding.

'Tis of this point I wish particularly now to speak. I know of no better way than to describe to you certain cases reported by Dr. C. C. Lyford, of Minnesota, and read before the twenty-seventh annual meeting of the United States Veterinary Medical Association at Chicago, September 17, 1890. The report is made by him, he being requested by the State Board of Health, of Minnesota, to investigate the cases, which I will now cite. The investigation was made in May, and five sows with twenty-nine pigs from two to four months old were found. The animals were apparently to a casual observer perfectly healthy. Four sows were Poland-Chinas, the fifth was a Jersey red. The latter, save for a slight, scarcely perceptible cough, was to all indications healthy. All the rest were likewise seemingly in good health, except one Poland-China, that a few weeks previously had given birth to nine pigs, seemed run down in flesh, but otherwise in good health. She was doubtless affected with tubercle. Herein comes the part to us as interested in sanitation about which we should be most anxious. How could this disease have originated?

The Doctor goes on to state that upon further investigation he found that from twenty-two to twenty-five last spring pigs, all apparently healthy up to January 1, had run prior to that time with fat cattle. During the latter part of December six pigs were sent to a farm some four miles away, the rest remaining with the cattle. About the middle of January one of the steers became affected with tubercle as revealed by the *post-mortem* lesions which the Doctor describes. During February three to five pigs became weak across the loins and died, or were killed, the same lesions being found upon *post-mortem* as appeared in the steer.

Nothing further was done or thought of this matter, until recently eight hogs, presumably well, were received by DeWitt & Sons, of Minneapolis, were killed and dressed, and found upon examination of the lungs, kidneys and spleen, to be also affected with tubercle; these eight were of the number left to run with the cattle after the middle of January, the time the steer became sick. None of the six animals taken to the farm prior to the sickness of this steer were ever affected with tubercle, as some weeks previous to the receipt of these eight hogs the same firm received the six before mentioned from the same farrow, and found them to be perfectly healthy.

You may from this now draw your own conclusion. First, however, let me state that the steer, which was destroyed, was fed to the pigs left to run with the cattle. Now, the parties did perfectly right so far as they went; they destroyed the animal, thus rendering the herd safe from infection so far as direct contamination from the steer was concerned; but they caused their swine by the consumption of this steer to become the victims of the disease. Where then would this stop? The swine killed used for food, and man becomes from this steer the victim of tubercle; for we must all understand that the tubercle of man, beast and fowl is due to one and the same cause, manifest in the same ways, and also in like manner terminating.

I tell you, gentlemen, this is no light subject to be laughed at and passed lightly by, for 'tis of vital interest to the health and welfare not only of our live stock, but to that of man himself. One steer, cow, pig or chicken may infect and destroy whole families; this is not theory or an hypothecated idea, but, fearful as it may seem, a dread reality. I have seen (not heard of from rumor) animals extremely fine bred, as good individuals as man ever looked upon, round, fat and sleek, perhaps strongly inbred, that the breeder has strongly recommended as being excellent to breed from on account of their strong breeding. They have made the remark, that "here is an animal you may breed to any kind of a cow, or any way, and he will be all right." And yet, gentlemen, within four months from this statement I have seen that same animal dead of consumption.

The steer fed to the pigs should have either been killed and burned, or he should have been left to decay where nothing could have gotten to him.

We have now seen that it may be transmitted through heredity also by means of meat diseased. Still there is another means most prevalent in its transmission. I refer to the use of milk from animals thus affected; this may be seen often in calves. 'Tis by this means, however, oftener, perhaps, than any other that this monster bacillus gains entrance from animals to the human economy. Drinking the milk of cows promiscuously as we do, and from dairies, we thus lay ourselves open to become affected. Some even go so far as to desist from the practice of milk-drinking, but I think that is, perhaps, a little too far; yet I may be allowed thus to think, for I am a great lover of that article of food. Then here is another reason, you see, why we should slaughter or have destroyed all cows thus affected, in order that by means of the milk as a vehicle, one may not, through its accidental use, become affected.

But there are still more reasons why a steer, for example, should be destroyed or removed from a herd—these being the infectiousness and contagiousness of the malady. I was asked only a few days ago if there was any danger to the rest of the herd in allowing a Quinine to remain with it. My answer was, that there certainly was danger; but the gentleman seemed rather inclined to the opinion that I was wrong. 'Tis a fact, however, that a tuberculous animal of whatever sex or breed is of great danger to a herd. If you are a breeder, 'tis, if possible, greater than if you were a feeder, from the fact that having constantly on hand young things that you offer for sale, you may unwittingly dispose of one affected with this fearful disease, only to find out, too late, perhaps, at the expense of the purchaser and really also at your own cost, that the trouble was locked in his frame at the time of sale, to become manifest at some future, not far-distant period.

Can you not see what damage and loss you suffer, not only directly but indirectly, by such an operation? The existence of disease in a herd of cattle spreads as rapidly as does the report of a foul murder. Let it be known there is disease, and ere long every animal in your herd, whether well or not, will, according to Madame Rumor, be almost dead of disease. Would you be able to dispose of the offspring as readily as you did before? or, properly speaking, should you sell any at all? Yes, you could sell some; but how would you know that this disease, in its latent form, did not lie dormant, ready at the slightest provocation to arise in all its fury?

Doubtless many here present remember the outbreak of pleuro-pneumonia contageosa, we had within our State borders a few years ago; what trouble, confusion and wide-spread anxiety it caused; how the government authorities took hold of the matter, and by judicious management stamped out the dread monster; how they were severely criticised and made fun of, and said not to know what they were doing. Be that as it may, 'tis a fact beyond controversy, that this disease most fatal did exist among our cattle in a small area; yet 'tis also a fact beyond the shadow of a doubt that pleuro-pneumonia contageosa, thanks to our diligent officers, no more is harbored or finds a fit resting place among our cattle to-day. This has been gotten rid of. How? By killing and completely destroying those affected or even suspected of having been exposed to the disease.

Now, having seen this disease in all its dire and fearful reality—the alarm, damage and anxiety it caused—would you be surprised to hear that we harbor in our midst, nourish and cultivate a disease which in all respects is as grim and fearful, nay, perhaps even more so, inasmuch as it now has a good hold upon many herds in our State, as well as of the nation. The pleuro-pneumonia was stamped out, but now, with the extent that consumption exists in this country, to entirely stamp it out would be almost, if not quite an impossibility; yet by destroying all we find, we are able to hold it in check and prevent any further or wider spread of it.

Do not now, gentlemen, return to your several homes and destroy every animal you find with a cough, but rather do that which by the writing of this paper I have endeavored to persuade you to do; go home soberly to think over and study this matter; be not hasty in your conclusion or probably harsh in your condemnation of some thoughts, for it has been my purpose to interest you more particularly in the duty you owe your State, county and country, and last, but in reality first, to yourself and family. If, gentlemen, but one item has proved of interest, one idea new expressed, one thought to make you study been advanced, I feel my mission is ended, my task fulfilled, and full reward for my meager effort received. So now with pleasure submit this to your criticism, be it severe or mild.

ACTINOMYCOSIS.

Prepared for and presented at the Farmers' Institutes, by Dr. H B. ADAIR, Kansas City, Deputy State Veterinarian.

Actinomycosis, a disease that occurs in man and cattle—especially in the latter to a considerable extent, both in Europe and America—which has until of late years, received very little attention from scientists, but during the past year has created much excitement, especially in Illinois and Missouri. At Chicago and Kansas City the cattle affected with this disease are not permitted to be sold for human consumption, but are destroyed and consigned to the dessicating works. In a single day in Chicago there has been condemned as many as a hundred cattle affected with this disease, in its various stages. Actinomycosis is a disease commonly known by the name of "Lumpy jaw," from the enlarged condition of either the upper or lower jaws, as the case may be. It receives the name Actinomycosis from a small fungus of vegetable origin, that causes the disease called Actinomycosis described as peculiar, club-shaped corpuscles, radiating from a firm homogeneous center, and joined to this by longer or shorter, single or branched filamentous stalks. They are a large mould fungi, closely allied to the ordinary green mould, but differing from it or any other known mould in the radiating arrangement of the mycelia, as seen in fully developed tufts.

If we examine the pus enclosed in one of these lumps, it will be seen to contain numerous small dull-white granules, very uniform in looks to the unaided eye. These are the tufts of actinomyces, the only known mould that has been found to invade the animal tissues. They have been found in necrosis of the teeth in man; scrapings from the tongue and tonsils and mucous membranes of the mouth in a number of cattle from twelve to twenty-four hours after they have been fed, allowing the mouth to act as a culture soil for the fungi that might be retained between the teeth or adhere to the mucus membrane of the mouth and tonsils. In five out of fifteen cattle the fungi was found. They have also been found in bran or the outer coatings of grain, siftings of grain-chaff or husks of grain. In smut from corn the fungus was found. Fodder and pith of corn-stalks, together with the scrapings of the outside of the stalks, revealed a fungus, thought to be actinomyces. In Europe only forty-nine cases in man have been recorded and only four in America. This small percentage may be accounted for by the reason of the disease being improperly diagnosed or classed as scrofula.

Rosenbach claims the disease to be a very common affection among the country people in the neighborhood of Gottingen. He further states that the disease commences usually in connection with the jaws, and appeared to be dependent upon carious teeth involving the alvovli. This we find true, as cattle take this mould in with their feed, and when it comes in contact with an abrasion on the tongue, mucous membrane of mouth or gums, it multiplies and the disease is established; it extends with time; the bones of the face or jaws become affected; immense tumors take the place of the bones; the teeth are crowded out of apposition with those in the healthy jaw; the animal is unable to properly masticate its food; in consequence becomes very emaciated; finally the lungs and mucous membranes of the intestines become affected, lumps appearing on the intestines in great numbers, varying in size from a millet seed to a hen-egg.

I have never found the red meat or muscles affected. From this I am led to believe that the medium of infection is not carried in the circulation to any great extent, if any. It is an undecided question whether the eating of the meat of a "lump-jaw" will cause the disease in man; if well cooked it will not; if only the muscles are eaten, I think it will not. Therefore, where an animal is fat, the disease only local, I see no reason for the condemnation of the whole carcass, unless it be for the reason that we have enough sound cattle and plenty to spare.

I have no evidence either way if one animal will become affected from another animal by coming in contact or by licking the discharge from the tumors. Therefore, until the nature of the disease is established without a doubt, I would advise the separation of the affected from the unaffected. Those that are affected only slightly may be treated with some success, especially where the mastication is not interfered with to any extent. The treatment consists in half an ounce of arsenious acid, two drachms of caustic potash made into a paste with one-half ounce of gum acacia and one ounce of dish-water; cast the animal, make a free incision into the tumors, saturate some adsorbent cotton with this paste and fill the incision with the cotton and paste; hold it in by taking a stitch in the skin, let the animal up, and in a few days a slough will take place, and you will have a healthy granulating wound. Some cases require two applications. Where the tongue is affected, it is recommended to paint it with iodine. I have only met with one case where the tongue was affected, although it is often crowded out of place by the tumors on the jaws.

The important point in the diagnosis of the disease is this fungi (*Actinomyces*).

LAMENESS IN THE HORSE.

Written by DR. JOHN S. MEYERS, Deputy State Veterinarian, St. Joseph, Mo., and read at the Farmers' Institute held at Marysville, Mo.

This is a subject of great importance. The word "lame," according to Percival, is from the Anglo-Saxon *lam*, weak; the terms "lame" and "weak" are synonomous in some parts of England. Thus it is a common expression to hear, "That is a lame story," for a weak story, or a "lame excuse."

Others define it as a manifestation of one or more of the limbs, of pain, weakness, inability or impediment—the act of progression not being necessary to the manifestation of such.

Lameness is not of itself a disease, but a sign of it. It is the expression of pain or inability, the result of disease or malformation in the limb or limbs by which it is manifested. It may, however, arise from disease apart from the limb, as from injury to or disease of the spinal cord or nerves, from cerebral disease, and occasionally disease of the liver.

It may exist for a short time independent of disease, a mere expression of pain without disease, as from a stone or gravel in the foot, or a badly fitting shoe; but if these causes of pain exist for any length of time, inflammation is sure to follow.

Disease much oftener exists in a limb without lameness, than lameness without disease.

Thus, a horse may have a wound, ulcer, bony deposit, or a tumor, without evincing lameness.

From these particulars we may argue that lameness is never present without pain.

Pain may be generally said to be the common cause of lameness. The patient feels the pain either when he moves the limb or when he bears weight or pressure upon it.

During motion, the patient endeavors to avoid throwing pressure upon the lame limb, by treading lightly or stopping short, and by removing weight as far from the seat of pain as it possibly can, as by treading on the heels when the pain is in the anterior part of a limb or foot, and upon the toes when in the posterior part or heel; also by throwing the weight from the lame limb as much as he possibly can.

A horse may be lame from excess of tonicity in the muscles of a limb, accompanied by much pain, as in cramp, which renders him for the time being dead lame.

In other cases lameness may be due to disease in the blood-vessels of the limb or their parent trunks. For example, most extreme lameness is manifested in limbs when their arteries of supply become plugged by emboli (fibrinous plugs). In these cases they show symptoms of great agony, when put to work, while in the stable no signs of pain are present; but when put to work, after going some distance they become immovable with pain: after a short period of repose these symptoms will disappear, but appear again when put to work.

The signs indicative of the seat of lameness are of two kinds: First, those manifested by action; and second, those discoverable by examination, while the animal is in a state of rest. In some instances the latter are alone sufficient to indicate the seat and nature of the disease, but the lameness must be of a severe character, manifested by "pointing," standing with the lame limb flexed, or even completely elevated from the ground; or, as in laminitis, with the unaffected feet and limbs placed as much under the body as possible. In the majority of cases, however, it is necessary to cause the patient to perform some movement; and it is agreed by all practical men that the slow trot is the best pace.

The horse may walk lame, but if such is the case, he must be very lame. There are cases, however, as in "slight splint lameness," where it is necessary to urge the animal to a sharp trot before any deviation from the normal gait can be distinguished.

There are some lamenesses which are only manifested after sharp work, and in such cases it is necessary to give the horse half an hour's trot or gallop, tying him afterward in a stall until he becomes cool.

When taken out of the stable and trotted after such a test, lameness, if in existence, will most assuredly be detectable. This latter test is only necessary in suspicious cases, such as badly formed hocks, splints near the knee, or some alteration of structure in any part of the limb, or in case where there is "pointing" while at rest, or where the disease is very slight.

The first point to be determined is the limb in which the patient is lame. This may seem an easy matter, but in reality it is attended with no little difficulty. Thus a mistake may be made by the peculiarity of gait, which has been called by some "cross-lameness." For example, a horse lame in the off fore-leg is trotted from the observer; he seems as if he were lame in the near hind, for the quarter seems to ascend and descend; but when the animal is trotted toward the observer, it will be seen that the irregular motion of the hind-quarter depends upon the elevation and dropping of the head and body; and the lameness in reality is in the fore and not the hind limb. Of course there are many cases where lameness is so apparant that such an examination is uncalled for; at the same time, there are many other cases so slight in degree as to require the most rigid scrutiny.

The next difficulty is the detection of lameness, when it is situated in both fore feet; when such is the case, an animal may seem to go as if sound.

Advantage has been taken of this by low horse dealers, who, when they have a horse lame in one fore foot, make him lame in the other also; this is by them technically termed "beaning," and consists in placing a small piece of iron tightly under the shoe of the sound foot; which produces so much pain, it causes lameness.

A more refined method has lately come into vogue, that of paring the toe of the sound foot nearly to the quick, and so adapting the shoe as to press upon the weakened spot.

A horse lame in both feet, although he may not drop in his gait, will be short in action; will go, as it has been more forcibly than elegantly expressed, "like a cat on hot bricks."

Each foot is carefully put to the ground, and quickly lifted up again, while at the same time there is a rolling motion of the body. In other cases he may exhibit the lameness in one foot as he goes from, and in the other as he approaches the observer. Such cases are very confusing, and require a great deal of skill and close observation.

When the lameness is in both hind limbs, the difficulty of diagnosis is not so great, as the animal is both stiff and lame; but mere stiffness must be distinguished from lameness, although it is often confounded with it. But lameness is indicative of active pain or disease, although it may pass off with exercise; still, it must not be confounded with stiffness.

The manifestation of lameness by the animal is shown in two ways: First, during repose, and second, during movement. In some cases, the appearance, or expression, is much more palpable while the animal is standing still, as in many foot lamenesses. For example, a horse will continually point, or even elevate, the foot which is suffering pain; if both feet, each foot alternately will be pointed or elevated. But if he is made to move, the extent of the lameness does not seem equivalent to the amount of pain so expressed. In other cases the patient will stand perfectly firm, although in the great majority of cases the pastern of the lame limb is more upright than that of the sound one, as if he feared to put as much weight upon it; but when made to move, he will immediately exhibit lameness. Again, many cases are seen where the patients come out of the stable sound; when they have performed some work or exercise, lameness becomes manifested. Others, again, leave the stable very lame, and become free in their action when they have been warmed with exercise. Such cases are apt to deceive.

Some horses exhibit their lameness when they turn round. They may go well enough if led straight to or from the observer; but when sharply turned round, they at once manifest the unsoundness; slight chorea, or string-halt, is seldom detected, except during the turn; and there are cases where it is manifest when the animal is turned one way only.

The signs of lameness manifested during repose are very important and sometimes diagnostic. A horse suffering acute pain in one of his front legs will point the foot; by pointing is meant the extension of one limb in advance of its fellow. This is done for the purpose of relieving pain, and is performed by throwing the flexors in a state of relaxation, and removing any tension or pressure from the painful part. This pointing does not apply to every lameness in a fore limb, nor particularly to any cause of it, for in some rare instances a horse may be lame in both fore feet from chronic navicular disease, yet never point. The pointing of elbow lameness is characteristic, the fore-arm being extended, the knee in a state of flexion and the foot upon a level with or posterior to its fellow. In severe shoulder lameness, the pointing, if it can be called such, is backward, the limb relaxed, the knee bent, and the foot posterior to its fellow; sometimes the toe only touching the ground; the whole of the limb semi-pendulous, consequent upon the inability of the muscles to elevate and bring it forward without pain; as a man fails to lift his arm when his shoulder is injured or diseased.

If the lameness be in a hind limb, the patient may stand with it either flexed, "knuckling over" at the fetlock, or with the foot off the ground altogether. When he stands with his lame (hind) leg in advance of the sound one, the position generally indicates disease in or below the hock.

A horse with acute pain in the fore feet will stand with his hind ones advanced beneath the body, resting first one fore foot and then the other, and every time he moves will rear up his head and stretch out his neck in expression of pain he suffers; but should the pain be in both hind feet, he will stand with his front feet beneath his chest and toward the central line of gravity, his body pushed forward, and head hung down, in order to remove the weight as far as possible from the seat of pain. He will first ease one hind foot and then the other, breathing heavily, and showing other signs of acute pain. Pain in both hind feet often interferes with the act of urination, by preventing that stretching of the body which is so characteristic of that act in the horse. In such cases the poor animal will endeavor to stretch himself, will elevate tail, but with a groan quickly assume his former posture, and suddenly "pick up" the feet alternately. From this fact it is often supposed that a horse suffering acute pain in the hind feet has some disease of the urinary organs.

The gait only is sometimes sufficient to determine the seat of lameness, and in some cases is the only guide; but it is a good rule, and one that should never be neglected, to examine the lame limb while the animal is in a state of rest. By the latter method we discover lameness by positive and negative signs. For example, if there be heat, pain or swelling in any part of the limb, discoverable by manipulation, the evidence is positive that the cause is in such a part; but if, on the other hand, there be neither pain, heat nor swelling in the limb, nothing in the superficial parts of the foot to account for it, we must conclude that it is deep-seated in the foot, or in a part thickly clothed by healthy tissues, and we must arrive at a conclusion by negative evidence, assisted by peculiarities of gait.

Lameness may be caused by a strain of a ligament, muscular tissue, tendon, by fractures diseased bones, cartilage or fibro-cartilage, morbid condition of the skin, neuromatous and other tumors; plugging of arteries, accidents, as "pricks" in shoeing, "treads," wounds, ulcers, rheumatisms, and reflex nervous action, as in diseased liver.

There is a great deal more that could be said on this subject, but I do not wish to tire you, and lose the possible good effect of what I have already said.

THE MISSOURI WEATHER SERVICE.*

BY FRANCIS E. NIPHER.

The first proposition to distribute weather warnings by telegraph for the benefit of commerce and agriculture was made by Lieutenant Maury, a man whose name was a household word before the war, and whose scientific services to the country have never been excelled.

The plan was carried out on a large scale soon after the war by the signal corps of the army, which was reorganized by General Meyer for that service.

In comparing our weather service with those of countries like England, Germany, Norway, Sweden, it should be remembered that they have areas comparable with those of States like Missouri.

For the prediction of large storms, like those which characterize our winter months, the vast extent of our national area is of great advantage. But many storms are local in their character, and to study and predict such storms, over so vast an area, from a single office, is a very difficult task indeed. It has never been satisfactorily done.

Moreover, the study of the climate of States can be best done by the States themselves. Recognizing these difficulties of the national service, Dr. Hinrichs, then a citizen of Iowa, organized the Iowa Weather Service about fifteen years ago, and shortly afterward the Missouri Weather Service was organized by myself. For a number of years these two State services were the only ones in existence in the country.

The Missouri Weather Service I have continued up to the present time, and it is now being conducted wholly on private means. In the meantime, such services have been started in many other States, and their number is increasing in a very gratifying way. Many of the States have made liberal appropriations for them, and there is little doubt that finally each State will be furnished with a well-supported weather service.

There are always many intelligent persons in each state who take an interest in weather observations, and who take an honest pride in co-operating with a public service. The people of the country are not yet all wholly given to money-getting. I have found them in many cases willing to expend considerable amounts for instruments. The daily work of the observer requires only a few minutes, but it is a constant care. If he is absent for a day it is necessary for him to provide for the making of the observations in his absence. When men of this kind can be found who are willing to render a valuable service to the State free of charge, they ought to be encouraged. That kind of statesmen are not by any means too numerous.

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*Delivered by request of the State Board of Agriculture in Representative Hall, Jefferson City, Mo., January 15, 1891.

The State weather service should aim to study the climate of the State, with particular reference to the crops that are grown. What are the conditions of weather which cause insect pests to thrive? How frequently do the weather conditions cause ruinous damage? Does it therefore pay to raise certain crops, and may we more profitably give our attention to other crops more suited to our conditions? These are questions which should be examined by an appeal to weather records and market and crop reports.

Bridge and railway engineers are interested in knowing how frequently rains of three, four, five or six inches may fall in a single hour. How frequently does it rain for three hours at the rate of two inches an hour? Until such questions can be answered with reasonable precision, the dimensions most suitable for culverts and water-ways, for railroad and highway bridges, can only be rudely estimated.

If the water supply of a city is partly or wholly derived from rainfall, it is most important to have authoritative records of severe drouths. In no other way can the proper storage capacity of the reservoir be determined.

Such records of the climate of different states should be furnished to the National service, which should combine the work of all the states and make up the rain and temperature charts for the entire country.

The work of weather prediction has thus far been carried on only by the National service. At first the country was divided into divisions comprising several states, as the Upper Mississippi valley, the Lower Ohio valley, etc. There has, however, been a demand for predictions of a more local character, and the National service has attempted to meet this demand. The predictions are now made for each state. Evidently, however, the difficulty of making weather predictions from a single office increases very rapidly as the predictions become more local in their character, and for two reasons. In the first place, the time that can be given to the predictions by a single officer is only about one minute for each state. He glances over the network of pressure and temperature lines, he notes the regions where rain may have fallen, he sees how the conditions have been changing since the last map was made, and by a sort of intuition, and perhaps without being always able to give definite reasons for his conclusions, he makes up our weather to the best of his knowledge and belief. The more local his predictions are, the less will be his time for considering the conditions in any one locality.

Further, the phenomena increase amazingly in complexity as we come to consider minute details. We all have a fair idea of the general topography of our country, so long as we confine our attention to its grand outlines. Rising from the eastern ocean, the surface culminates in a mountain range stretching from near the Gulf of Mexico to New England. To the west we have a descending slope to the Mississippi river; then come another rising slope, the great plains, the western mountain ranges, and a descent to the sea. Suppose, now, we come to consider the matter more minutely. We shall soon be lost in a mass of details which it is absolutely impossible for any one man to picture in his mind, as we can all picture the grand features of topography. Nevertheless, the hills on our farms are important matters to us, and they concern us more directly and constantly than do the Mississippi valley or the Allegheny mountains.

In a similar way must it remain forever impossible for any one man to give us the information we should have in regard to the weather. He can form a general idea of the movement of the larger storms and cold waves which are common in winter, and such information is of vast importance to many people. The movement of thousands of tons of meats, fruits and vegetables is controlled wholly by the weather reports. On the approach of warmer weather, meats are hurried into cold-storage warehouses, and the opportunity to ship other provisions which must be kept from freezing is anticipated and made available.

But the storms which are of the greatest interest to the farmer are the local rains of summer. They surprise him with his hay down, and they destroy or damage his crop. They are very local in their character, often expending themselves over a few counties. Sometimes these rain-storms travel over a belt of country twenty-five to fifty miles in breadth, and extend across a state. You see a heavy bank of cloud edging up against a brisk wind. As it approaches, you see that its front is margined below with long streamers, and above is tumbled into rounded heaps by the winds. The deep rumble of thunder increases to a roar. Suddenly the wind, which has been blowing toward the storm, ceases, as you pass through a belt of upward currents which margin the cloud-front, and then, with a mighty rush of roaring wind and beating rain, the storm is upon us. The wind gradually lessens, the clouds show a smooth leaden hue, the rain sets in steadily for an hour or more, during which the wind backs around into its original direction. The cloud finally begins to disperse and the storm is over.

Not a season passes that single storms of this kind do not inflict enough of preventable damage to pay the annual expense of a State weather service. But it is impossible for the Washington office to predict storms of this kind for the whole country. It is absolutely out of the question. No one man can mentally picture the meteorology of the country down to such minute details. Such work must be done by a local weather service. and it can be so done.

The National weather service now issues predictions which often read, "Local rains in Missouri." Now it is not of great importance to a farmer in Saline county who has cured hay spread over his field as the mower left it, that merchants and other good people in Sedalia, Hannibal or St. Louis should read in their morning papers that there will be local rains in Missouri.

The farmer is not in communication with these people, or with the Washington office, and hence cannot share the joy of this discovery.

And furthermore, such predictions would be of very little value to any farmer, even if they could be laid upon his table each morning. Such rains may occur here and there in a few counties, but there is little gain in setting all the people of the State into motion in preparing for rain, which will affect perhaps only a small portion of them. The result is that people who can get such weather predictions pay little attention to them, because they have learned by experience that this simply means, it may rain in our particular locality, and it may not, a thing which they know fairly well without the aid of any weather predictions.

But such predictions from the National weather service, with data giving the general conditions of the weather, would be of great value to a local weather service, and I wish to give a brief sketch of how they may and will be utilized in the near future.

It will be but a short time when the broad patents on the telephone will expire. This will have little effect on the large telephone systems of great cities, but it will undoubtedly compel a decrease in telephone rates in smaller cities, so that farmers can afford to use them. In such places it will be possible for competing systems to start, for the use of farmers, and the tradesmen will go with the farmers. I do not anticipate such competition, as telephone people are good business men, and they will hold their ground by reducing their rates to fifteen or twenty dollars a year for farmers. Under such conditions any farmer could afford to place a telephone in his house. The value to him is evident enough. He can keep continually informed of the markets. He will never stand on the streets with a load of hay waiting for a customer, and wishing that his hay were home again. He will know before he starts from home, who will buy his produce, and what he will get for it, and he will keep it in his barn until he gets his price. During the busy time of harvest, if his reaper breaks down, he can learn whether the new casting which he needs can be procured in town, and if not, he can order it. The grocer and butcher will fill his orders, and delivery men who make this their business will each morning make up a route to deliver his goods, bring his mail, and perform any other service which he may desire. In addition to this, he may at any time get the weather reports. The local weather service can, during the harvest season, receive information of the appearance of any storm, and can telephone the proper warning to the county seats, where such information should be sent. The telephone companies will receive and transmit such warnings to their subscribers, in order to increase the value of their service, and induce people to use their telephones. A warning of rain can be rung on all the call-bells by a code of signals. Many of the subscribers will be prepared for a rain, and to them this warning will be sufficient. If a farmer wishes to know more about the situation, in order to be better able to decide his plans, he may call up the central office at the county seat, and learn that it is now raining in all the counties to the west, and apparently a general rain is coming in about two hours. No thoughtful man can fail to be impressed with the profound influence which the telephone is destined to exert upon the condition of the farmer. It is perfectly apparent that all of these advantages, with many others, are entirely within his reach as soon as the telephone ceases to be a monopoly. That the service can then be rendered at a price such that no enterprising farmer can afford to be without his telephone is equally certain.

The inauguration of such a system of harvest storm warnings will necessarily be done gradually. It can be best done by a weather service supported by the State. Some one must take hold of the matter and show that it can be done. At present such a weather service should have the necessary means to make a study of local summer rains. They have as yet received little study. The State weather service should secure correspondents in each county, who should be provided with blanks for recording the time of beginning and ending of each storm, the direction of motion of the cloud, the amount of rain, and such other features as may be observed. Such reports would in a few years give a good knowledge of the behavior of summer storms. By that time it will be feasible to inaugurate the plan which I have roughly outlined.

This is not the first time I have been here to advocate this cause. In 1883, and again during the last Legislative session, I made a similar presentation of this plan. It has been my dream for thirteen years, and I have expended many hard-earned dollars in trying to bring the plan to completion. It may be that the State Board of Agriculture can succeed in securing the inauguration of a measure which I as a humble citizen have thus far failed to bring about as I had wished. I am here, gentlemen of the Legislature, to urge upon you to entrust this work to their hands. I gladly step aside and transfer to them the interest which has been mine, and trust that they will secure the co-operation of the public and the support of the State. It is not a small or an unimportant matter which we are considering, and it is *not* an untried scheme. It is simply supplemental to what is now being done by the National service. The work laid out for the State service is work which the National service is not doing, and cannot do, but it is a work in which the National service can greatly aid by co-operation with States which show a disposition to help themselves.

MONTHLY METEOROLOGICAL REPORTS

FOR THE YEAR 1890

MONTHLY METEOROLOGICAL REPORT

OF THE

STATE BOARD OF AGRICULTURE.

(CO-OPERATING WITH THE U. S. SIGNAL SERVICE.)

January.

The month was noted for the high temperature and the excessive rains in the southern half of the State. The temperature ranged from 3° in the northern portion to 12° in the southern portion above the normal for January.

SUMMARY.

PRESSURE (in inches).—Monthly mean 30.212; highest, 30.790 at Glasgow on the 16th; lowest 29.530 at Glasgow on the 26th.

TEMPERATURE (in deg. Fahr.).—Monthly mean 33.6; highest monthly mean 45.6 at Protem; lowest monthly mean 21.8 at Oregon; maximum 81 on the 26th at Protem; minimum 19 below zero on the 11th at Conception; range for the State 100; greatest local monthly range, 81 at Oregon; least local monthly range, 56 at Warrenton.

PRECIPITATION (in inches).—Average for the State 4.31; greatest 10.50 at Ironton and New Haven; least 1.27 at Leavenworth, Kan.; greatest amount of unmelted snow was 14.1 at Oregon. Rainfalls of over two inches in twenty-four hours occurred as follows: Carthage 11th and 12th, 2 65; Ironton 1st, 3.75; New Haven 4th to 6th, 5.00; Protem 6th and 7th, 2.40; Oak Ridge 1st, 2.50; 12th, 2.00; St. Charles (1) 1st, 2.50; Willow Springs 1st, 2.90.

THUNDER STORMS.—Columbia, Ironton, St. Louis, Springfield and Steelville, 12th; Protem 1st, 12th, 19th and 31st; Willow Springs 12th, 18th and 31st; Oak Ridge 22d.

HAIL.—Glasgow, 6th; Sedalia, 6th and 7th.

LUNAR HALOS.—Appleton City, 2d; Columbia, 1st and 2d; Fayette, 2d, 25th and 30th; Glasgow, 30th; Harrisonville, 2d; Miami, 2d and 3d; Oregon, 26th, 29th, 30th and 31st; Protem, 2d; St. Charles (1), 2d; Springfield, 1st and 30th.

SOLAR HALOS.—Kidder, 15th and 16th; Oregon, 24th; parhelia at Fayette, 20th; Oregon, 15th; Withers' Mill, 2d.

Prevailing direction of wind, south; average hourly velocity, 9.0 miles; extreme velocity, 56 s. w., at St. Louis on the 12th.

February.

SUMMARY.

Pressure (in inches).—Monthly mean 30.107; highest 30.700 on the 21st at Keokuk and Fayette; lowest 29.640 on the 23d at Glasgow.

Temperature (in deg. Fahr.)—Monthly mean 35.5; highest monthly mean 44.6 at Cairo, Ill.; lowest monthly mean 28.3 at Craig. Maximum 81 on the 24th at Protem; minimum 8 deg. below zero on the the 28th at Conception. Range for the State 89; greatest local monthly range 78 at Springfield; least local monthly range 57 at Cairo, Ill.

Precipitation (in inches).—Average for the State 2.12; greatest 7.57 at Cairo; least 0.32 ot Hannibal. Greatest amount of unmelted snow 10.4 at Conception.

Thunder Storms.—Appleton City 26th; Brunswick 25th; Cairo, Ill., 19th, 23d, 24th, 25th; Columbia 19th, 25th; Fayette 19th, 25th; Glasgow 19th; Harris 25th; Hannibal 25th; Harrisonville 19th, 25th; Ironton 24th, 25th; Miami 18th; Oak Ridge 11th, 23d, 24th; Protem 19th, 24th, 25th, 26th; Steelville 25th; Warrensburg 19th, 26th.

Hail.—Fayette 19th, 26th, 27th; Glasgow 26th, 27th; Harris 25th; Kansas City (2) 27th; St. Charles (1) 19th; Sedalia 26th; St. Charles 24th, 25th; Warrensburg 19th.

Lunar Halos.—Appleton City 2d, 3d; Columbia 24th; Excelsior Springs 2d; Oregon 2d, 4th, 5th.

Solar Halos.—Appleton City 28th; Columbia 28th; Fayette 7th, 13th, 21st Glasgow 13th, 28th; Oregon 7th, 20th, 24th.

Parhelia.—Columbia 28th; Fayette 13th, 20th, 28th; Withers' Mill 28th.

Aurora.—At Oregon on the 20th. Polar bands at Protem on the 16th. The river at Hannibal reached the low-water mark of 1857. Prevailing direction of wind northwest; average hourly velocity 8.8 miles; extreme velocity 37 northwest at St. Louis on the 19th.

March.

The first ten days of the month was the coldest period of the season. The mean temperature was about 4° below the normal, and its variation from day to day was unusually slight. Excessive rain-falls occurred in the southeast section on the 10th and 11th and on the 26th and 27th. An unprecedented low barometric area, accompanied by heavy rain, hail and high winds passed over the State on the 27th, causing considerable damage to houses and fences. A cyclone passed over the extreme southeastern corner of the State about 4 p. m. of the 27th, killing four people at Hoff's station, Mississippi county, and injuring several others.

SUMMARY.

Pressure (in inches).—Monthly mean, 30.114; highest, 30.680 on the 15th at Leavenworth; lowest, 29 017 on the 27th at Glasgow and 28.74 at St. Charles.

Temperature (in degs. Fahr.)—Monthly mean, 27.4; highest monthly mean, 42.9 at Carthage and Cairo; lowest monthly mean, 32.2 at Conception; maximum, 78 on the 23rd at Ozark; minimum, 11 below zero on the 1st at Princeton; range for the State, 89; greatest local monthly range, 83 at Conception; least local monthly range, 63 at St. Louis and Cairo.

PRECIPITATION (in inches).—Average for the State, 3.47; greatest, 14.20 at Oak Ridge; least .77 at Craig. Greatest amount of unmelted snow, 17 at New Haven, 15 of which fell on the 30th and 31st. Excessive rain-falls: New Haven, 2.50 on 26th and 27th; Oak Ridge, 3.50 on 10th and 11th, 2.00 on the 13th, 5.50 on 26th and 27th; Ozark, 3.00 on 10th and 11th; Shelbina, 2.50 on 26th; St. Louis, 2.31 on 27th; Thayer, 5.01 on 10th and 11th.

THUNDER-STORMS.—Carrollton, 26; Clinton, 29; Columbia, 18, 20, 27; Conception, 27; Fayette, 18, 20, 27; Glasgow, 18, 20, 27; Kansas City. 26, 27; Lebanon, 29; Oak Ridge, 10, 24, 26, 27, 30; Ozark, 28; Oregon, 27, 30; Pickering, 27; Princeton, 27; St. Charles, 18, 26, 27; Sedalia, 26, 27; Steelville, 27, 30; Withers' Mill, 27.

HAIL.—Fayette, Glasgow and Sedalia, 9; Fayette, 18, 20; Columbia, Cuba, Glasgow, Jackson, Mexico, Oak Ridge, Ozark, Sedalia and Steelville, 27; Lebanon, Sedalia and Thayer, 30.

LUNAR HALOS.—Columbia, 2, 3, 29; Fayette, 29; Glasgow, 25, 29; Kansas City, 2, 4; Oregon, 2, 5, 8, 25, 31; Miami, 29; St. Charles, 2, 3, 31; Withers Mill, 2.

SOLAR HALOS.—Fayette, 2, 3, 21, 29; Glasgow, 29; Miami, 2; Oregon, 2, 3; St. Charles, 2.

PARHELIA.—Fayette. 2, 15; Miami, 2.

AURORA.—Ozark, 5.

METEOR.—Oregon, 15.

WIND.—Prevailing direction, northwest; average hourly velocity, 9.2 miles.

April.

SUMMARY.

PRESSURE (in inches)—Monthly mean 30.052; highest 30.537 on the 1st at Keokuk, Iowa; lowest 29.445 on the 8th at Glasgow.

TEMPERATURE (in degrees Fahr.)—Monthly mean 56.9; highest monthly mean 60.2 at Ozark; lowest monthly mean 53.9 at Conception; maximum 92 at Hannibal 8th, Liberty 30th and Willow Springs 9th; minimum 25 on the 1st at Conception; range for State 67; greatest local monthly range 65 at Liberty; least local monthly range 44 at Cairo.

PRECIPITATION (in inches)—Average for the State 3.01; greatest 7.00 at Kansas City (2); least 1.03 at Conception; excessive rainfalls, viz., Bolivar 3.00 on the 6th; California 4.00 on the 25th and 26th; Salem 6.00 on the 22d, 23d and 24th; Seybert 3.00 on the 24th.

THUNDER-STORMS.—Columbia 3, 6, 13, 30; Conception 30; Excelsior Springs 30; Fayette 6, 7, 12, 13, 30; Glasgow 7, 9, 30; Grand Pass 8, 30; Ironton 8, 25, 26; Oregon 3, 30; Oak Ridge 8, 25, 26; Pickering 30; Princeton 8, 22, 30; St. Charles 13; Sedalia 30; Springfield 2, 12, 13.

HAIL.—Bolivar 6; Kimmswick 13; Neosho 14.

LUNAR HALOS.—Oregon 4, 5, 8, 30; St. Charles 1, 7.

SOLAR HALOS.—Columbia 7; Conception 14; Fayette 24; Oregon 7, 20; St. Charles 5, 14

FROST.—Light frost was general over the State on the 1st, 10th and 18th, and in the northwestern portion on the 27th. Ice at Liberty on the 10th.

May.

SUMMARY.

Pressure (in inches).—Monthly mean 29.921; highest 30.327 on the 11th at Keokuk, Iowa; lowest 29.553 on the 9th at Leavenworth, Kansas.

Wind (in miles per hour).—Average hourly velocity 8.4; extreme velocity 49 south on the 23rd at St. Louis; prevailing direction south.

Temperature (in degrees Fahr). A monthly mean 63.3 highest monthly mean 68.4 at Willow Springs; lowest monthly mean 60.1 at Keokuk, Iowa; maximum 97 at Willow Springs on the 30th; minimum 32 at Platte River and Princeton on the 5th and Fayette on the 6th; range for the State 65; greatest local monthly range 63, at Willow Springs; least local monthly range 32 at Windsor.

Precipitation (in inches).—Average for the State, 3.87; 8.09, greatest at Cassville; least 1.15 at Craig. No snow during the month.

Thunder-storms.—Cassville 1, 30, 31; Columbia 1, 4, 6, 9, 12, 13, 17, 18, 22, 23; Craig 6, 17, 30, 31; Fayette 4, 12, 17, 18, 22, 23, 30; Glasgow 4, 9, 12, 23, 30, 31; Ironton 4, 6, 9, 10, 12, 13, 18, 23, 24; Kansas City 8, 9, 12, 17, 18, 20, 21, 22, 23, 30, 31; Liberty 3, 17, 30; New Haven 4, 12, 18, 23; Oak Ridge 4, 10, 12, 18, 19, 23; Oregon 4, 6, 8, 9. 12, 17, 20, 24, 25, 30, 31; Platte River 3, 8, 12, 17, 19, 20, 22, 23, 25, 30, 31; Princeton 9, 12, 22, 30, 31; Sarcoxie 9, 10, 12, 18, 23, 30, 31; Springfield 1, 9, 10, 12, 18, 23, 30, 31; Windsor 23, 31.

Hail.—Craig 6; Ironton 6; Platte River 8; Princeton 9, 41; Sarcoxie 12; Windsor 12, 23.

Lunar Halos.—Columbia, Fayette, Glasgow 29; Oregon 3, 5, 29.

Solar Halos.—Fayette 18.

Frosts.—Light frosts over the State from the 5th to 7th, and from 14th to 17th. Ice at Oregon on the 13th.

Zodiacal Light.—Oregon 19, 21.

Meteors.—Oregon 6; Princeton 5 p. m. 2nd, going north, and looked as large as full moon.

June.

The month was remarkable for the high temperature and the small rainfall. The mean daily temperature was 3.5 degrees above the normal, while the rainfall was 3 inches below the normal for June. While the number of thunder-storms was unusually large, very little rain accompanied them. A cyclone visited Mercer county on the 4th and did some damage. A hail-storm with stones one and a half to two inches in diameter did considerable damage to the crops in Holt county on the 14th.

SUMMARY.

Pressure (in inches).—Monthly mean, 29.946; highest, 30.354, on the 8th at St. Louis; lowest, 29.605, on the 4th at Leavenworth, Kas.

Wind Movement.—Average hourly velocity, 7.6 miles; prevailing direction south; extreme velocity, 60 miles per hour, from the southwest, on the 10th, at St. Louis.

Temperature (in degrees Fahrenheit).—Monthly mean, 77.3; highest monthly mean, 83.7, at Liberty; lowest monthly mean, 73.8, at Cassville; maximum, 106, at Protem on the 26th, and at Eldon on the 30th; minimum, 44, at Glenwood on the 6th; range for the State, 62; greatest local monthly range, 55, at Excelsior Springs; least monthly range, 30, at Windsor.

Precipitation (in inches).—Average for the State, 2.56; greatest, 7.47, at Princeton; least, 0.37, at LaMonte. One inch of rain fell in one hour at Grand Pass on the 20th; 3.10 inches fell at Adrian on the 14th; very heavy rain at Platte River on the 19th.

Thunder-storms.—Adrian, 5, 14, 16 and 30; Carrollton, 9, 10, 11 and 19; Cassville, 11, 14 and 27; Columbia, 4, 11, 14, 16, 17, 18, 19, 23, 26, 27, 28, 29 and 30; Excelsior Springs, 16, 17, 19 and 20; Fayette, 4, 11, 14, 16, 17, 18, 23, 27, 28 and 29; Glasgow, 4, 10, 11, 14, 16, 17, 19, 27 and 29; Grand Pass, 10, 11, 14, 16, 17, 18, 19, 20, 22, 28, 29 and 30; Hannibal, 11; Harrisonville, 9; Ironton, 11 and 18; Kansas City (1), 4, 16, 17, 19, 20 and 30; Kansas City (2), 4, 10 and 17; Liberty, 4, 16 and 19; New Haven, 4, 12, 18, 22 and 29; Oak Ridge, 12, 13, 14, 15, 17, 18, 25, 26 and 29; Oregon, 3, 11, 14, 16, 17 and 19; Platte River, 1, 3, 4, 10, 11, 14, 16, 17, 19, 22 and 29; Princeton, 3, 4, 10, 14, 17, 19 and 23; Protem, 1, 4, 5, 11, 15, 16, 17, 18, 26, 27, 28, 29 and 30; St. Charles (1), 1, 3, 4, 11, 13, 16 and 29; Sarcoxie, 4 and 29; Sedalia, 4, 10, 14, 17 and 28; Springfield, 4, 8, 14, 15, 16, 27, 28 and 30; Warrensburg, 4, 17 and 29; Windsor, 14 and 16; Withers' Mill, 14.

Hail.—Grand Pass, 18; Oregon, 14 (stones one and a half to two inches in diameter); Platte River, 14; Protem, 16; Sarcoxie, 5.

Solar Halos.—Fayette, 2, 7 and 8; Protem, 7.

Cyclone.—Princeton on the 4th.

July.

The mean daily temperature for the month was 1.4 degrees above the normal for the State. There was a cool period from the 4th to the 5th, and from the 18th to the 25th, and an excessively warm period from the 6th to the 17th. The rainfall was 2.36 inches below the normal for the State. Nearly all of the rain fell between the 15th and 22d.

SUMMARY.

Pressure (in inches).—Monthly mean, 29.988; highest, 30.209 on the 20th at St. Louis; lowest, 29.739 on the 13th at Glasgow.

Wind Movement.—Average hourly velocity, 6.8 miles; prevailing direction, south; extreme velocity, 48 N. E. on the 17th at Cairo, Ill.

Temperature (in deg. Fahr.)—Monthly mean, 79.2; highest monthly mean, 85.4 at Bradleyville; lowest monthly mean, 74.4 at Pickering; maximum, 110 at Pickering on the 13th; minimum, 44 at Adrian on the 4th; range for the State, 66; greatest local monthly range, 64 at Pickering; least local monthly range, 28 at Bradleyville.

Precipitation (in inches).—Average for the State, 3.03; greatest, 6.85 at Ironton; least, 0.20 at St. Charles (1).

Excessive Rainfalls.—Carrollton, 2.10 in three hours on the 20th; Columbia, 2.04 on night of 16th; Grand Pass, 1.02 in fifty minutes on the 19th; Ironton, 2.25 on the 14th and 3.25 on the 23d.

THUNDER-STORMS.—Adrain, 8, 14; Bradleyville, 7, 9, 16, 20, 21, 27; Carrollton, 8, 17, 19, 20, 21; Cassville, 7, 8, 15, 18, 21; Columbia, 3, 8, 11, 13, 14, 17, 18, 19, 20, 31; Excelsior Springs, 11, 15, 18, 19, 20, 21, 31; Glasgow, 3, 8, 11, 12, 14, 15, 17, 18, 19, 21, 31; Grand Pass, 3, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 31; Harrisonville, 8; Ironton, 7, 8, 12, 13, 15; Kansas City (1), 8, 14, 15, 17, 18, 21, 24, 31; Kansas City (2), 15, 21; Lebanon, 15, 19, 20; Liberty, 21, 24; New Haven, 8, 16, 17, 31; Oregon, 11, 14, 19, 21, 31; Oak Ridge, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 22, 23, 26, 27; Platte River, 15, 21, 24, 31; Pickering, 10, 14, 18, 19; Sarcoxie, 9, 15, 21; Sedalia, 3, 8, 11, 13, 14, 19, 20, 21, 31; Springfield, 7, 8, 9, 11, 14, 15, 18, 20, 21, 27; Steelville, 12, 13, 20; Windsor, 15; Withers' Mill, 8.

METEOR.—Brilliant meteor at 9 p. m. on the 19th, seen at Willow Springs, in the north, traveling southwest, and at Nevada in the northeast, moving northwest; elevation, 35 degrees.

LUNAR HALO.—Oregon, 1 and 21.

August.

The mean daily temperature was about 2½° below the normal in all parts of the state. The warmest period was from the 1st to the 8th and coolest on the 11th and 23d.

The rainfall for the State was 1¾ inches above the normal. The distribution of the rain was very uneven, ranging from 4 inches above in the southwest corner to 1½ below in the southeast corner of the State.

SUMMARY.

PRESSURE (in inches).—Monthly mean, 30.031; highest, 30.350 on the 23d at St. Louis; lowest, 29.796 on the 26th at Glasgow.

WIND MOVEMENT.—Average hourly velocity, 6.0 miles; prevailing direction, southeast; extreme velocity, 36, southwest on the 25th at Springfield.

TEMPERATURE (in deg. Fahr.)—Monthly mean, 73.5; highest monthly mean, 78.9 at Bradleyville; lowest monthly mean, 69.8 at Glenwood; maximum, 106 at Princeton on the 3d; minimum, 41 at Glenwood on the 20th; range for the State, 65; greatest local monthly range, 60 at Glenwood; least local monthly range, 30 at Lebanon and Bradleyville.

PRECIPITATION (in inches.)—Average for the State, 5.57; greatest, 15.39 at Sarcoxie; least, 1.10 at Withers' Mill.

EXCESSIVE RAINFALLS—Austin, 2.50 on 16th and 17th; 5.00 on 25th and 26th; Bethany, 3.75 on 12th and 13th; Bradleyville, 3.00 on 14th; 3.50 on 20th, 2.00 of which fell in one hour and fifteen minutes; Brunswick, 3.90 on 13th, 2.50 on 17th; Cassville, 2.75 on 10th; Grand Pass, 1.00 in 42 minutes on 16th; Miami, 3.90 on 12th and 13th; Protem, 0.51 in ten minutes on 19th; 0.90 in 40 minutes on 25th; Sarcoxie, 2.63 on 6th, 2.93 on 16th, 3.40 on 26th.

THUNDER-STORMS.—Adrian, 3, 8, 12, 16, 20, 25; Austin, 12, 16, 20, 25, 30; Bradleyville, 10, 13, 14, 20, 25, 26, 30; Carrollton, 4, 8, 13, 16; Cassville, 4, 10, 13, 14, 17, 19, 20, 30; Columbia, 4, 8, 9, 20, 21, 25; Fayette, 16, 25; Glasgow, 8, 12, 13, 16, 19, 20, 25, 26; Grand Pass, 1, 2, 3, 8, 12, 13, 16, 20, 25; Ironton, 2, 3, 8, 13, 19, 21; Kansas City (1), 3, 4, 8, 9, 12, 13, 16, 19, 25, 26, 30; Kansas City (2), 4, 12, 13, 17, 19, 21, 26; Keokuk, 13, 20, 28; Lebanon, 16, 19, 20, 24; Nevada, 10, 12, 25; New

Haven, 8, 13, 25; Oak Ridge, 1, 6, 8, 19; Platte River, 4, 6, 12, 16, 25; Protem, 1 to 6, 9, 10, 12, 13, 16, 17, 19, 20, 25, 26, 30; St. Charles (1), 8; Sarcoxie, 13, 16, 19, 26; Sedalia, 1, 8, 9, 13, 16, 19, 25; Springfield, 4, 6, 10, 13, 14, 17, 19, 21, 25, 26; Steelville, 3, 4, 8, 13, 20, 25; Windsor, 8, 16, 20, 25.

Hail.—Sarcoxie, 13th; Windsor, 8th.

Solar Halo.—Platte River, 22, 26, 27, 28, 29, 31.

September.

SUMMARY.

Pressure (in inches).—Monthly mean, 30.091; highest, 30.500 at Keokuk on the 28th; lowest, 29.728 on the 6th at Leavenworth.

Temperature (in degrees Fahr.).—Monthly mean, 64.5; highest monthly mean, 68.5 at Protem; lowest monthly mean, 60.2 at Adrian; maximum, 98 on the 7th at Protem; minimum, 27 on the 12th at Adrian; range for the State, 71; greatest local monthly range, 63 at Adrian; least local monthly range, 42 at Cairo and Steelville.

Precipitation (in inches).—Monthly mean, 4.23; greatest, 14.41 at Sarcoxie; least, 1.75 at St. Charles (1).

Excessive Rainfalls.—Brunswick, 2.50 on the 2d; Glasgow, 2.67 on the 2d; Ironton, 3.75 on the 8th and 9th; Protem, 3.23 on the 8th; 0.96 in one hour on the 12th, 5.46 on the 22d, 23d and 24th; Sarcoxie, 4.90 on the 7th and 8th; 4.31 on the 23d and 24th; Willow Springs, 3.37 on the 7th and 8th.

Thunder-storms.—Adrian, 18th; Austin, 12th and 18th; Carrollton, 7th and 8th; Cassville, 7th, 10th and 12th; Columbia, 2d, 4th, 18th and 19th; Excelsior Springs, 5th, 12th and 18th; Fayette, 2d, 7th and 18th; Glasgow, 2d, 7th, 12th and 18th; Grand Pass, 2d; Ironton, 5th and 8th; Kansas City (1); Kansas City (2), 8th, 12th and 19th; Liberty, 12th and 18th; New Haven, 8th; Oak Ridge, 6th; Oregon, 2d, 3d, 4th, 12th and 18th; Pickering, 18th; Platte River, 3d, 5th, 7th, 12th and 18th; Protem, 2d, 7th, 12th, 14th and 19th; Sarcoxie, 7th, 8th, 9th, 12th and 14th; Sedalia, 2d and 18th; Springfield, 2d, 7th, 8th, 12th, 18th and 19th; Steelville, 7th and 14th.

Lunar Halos.—Columbia, 22d; Fayette, 22d and 23d; Nevada, 26; Oregon, 23d, 25th and 28th.

Solar Halos.—Fayette, 20th, 22d and 23d; Platte River, 8th, 9th, 17th, 20th, 21st, 29th.

Hail.—Pickering, 18th.

Frost.—First frost at Pickering on the 8th; frost quite general on the 13th, 14th, 28th and 29th.

Ice.—Oregon on the 13th.

October.

SUMMARY.

Pressure (in inches).—Monthly mean, 30.004; highest, 30.380, at Kansas City, on the 31t; lowest, 29.450, at Keokuk, on the 13th.

Temperature (in deg. Fahr.)—Monthly mean, 55.4; highest monthly mean, 60.5, at Dadeville; lowest monthly mean, 49.9, at Pickering; maximum, 91, at Protem, on the 12th; minimum, 16, at Centreville, on the 31st; range for the State, 75; greatest local monthly range, 67, at Adrian and Centreville; least local monthly range, 44, at Warrenton.

Precipitation (in inches).—Monthly mean, 2.63; greatest, 5.19, at Carrollton; least, 0.40, at New Haven.

Excessive Rainfalls.—Bradleyville, 1.10 in 16 minutes on the 5th; Brunswick, 2.50 on the 3d; Kidder, 2.70, on the 12th and 13th; Liberty, 2.88 on the 12th.

Thunder-storms.—Austin, 3d and 12th; Bradleyville, 1st and 4th; Cairo, 1st and 16th; Carrollton, 2d; Columbia, 3d, 5th, 6th and 12th; Conception, 3d and 5th; Excelsior Springs, 8th, 10th, 12th, 13th, 15th and 16th; Fayette, 3d, 5th and 12th; Fortescue, 3d and 11th; Glasgow, 3d, 5th, 6th, 11th, 12th and 13th; Grand Pass, 3d, 5th, 12th and 13th; Ironton, 4th; Kansas City (1), 3d, 8th, 10th, 12th and 13th; Kansas City (2), 3d, 12th and 13th; Liberty, 3d, 10th and 12th; Marshall (2), 3d, 6th and 12th; Oregon, 8th, 9th and 12th; Pickering, 10th; Platte River, 3d, 9th, 10th and 12th; Protem, 3d, 4th, 5th, 13th, 19th and 20th; Sedalia, 3d and 5th; Springfield, 3d, 4th and 13th; Steelville, 4th.

Solar Halos.—Concordia, 5th; Fayette, 20th; Platte River, 20th and 28th.

Lunar Halos.—Columbia, 28th; Fayette, 28th; Kansas City, 21st, 23d and 28th; Oregon, 6th, 18th, 23d, 25th and 28th; Platte River, 5th, 20th and 28th; St. Charles, 28th.

Meteors.—Oregon, 18th and 19th.

Wind.—Monthly mean hourly velocity, 7.7 miles; prevailing direction from the south; extreme velocity, 42 miles per hour, on the 13th, at St. Louis.

November.

The temperature was about 5½° above the normal in all the sections of the State. The warmest days were from the 5th to the 7th, and the coolest from the 9th to the 12th and 23rd to 28th.

The rain-fall was below the normal for the State, but the distribution was very uneven, ranging from one inch below in some places to two inches above in others. The last half of the month was very dry, and stock water is scarce in many localities.

SUMMARY.

Pressure (in inches).—Monthly mean, 30.149; highest, 30.653 on the 22nd at Leavenworth; lowest, 29.613 on the 5th at Glasgow.

Temperature (in degrees Fahr.)—Monthly mean, 45.9; highest monthly mean, 51 at Cairo; lowest monthly mean, 39.6 at Glenwood; maximum, 86 on the 6th at New Haven; minimum, 14 on the 9th at Adrian, and on the 26th at Pickering; range for the State, 72; greatest local monthly range, 64 at Adrian; least monthly range, 44 at St. Louis.

Precipitation (in inches).—Monthly mean, 2.33; greatest, 6.08 at Cairo; least, .83 at Steelville; trace of snow at Pickering on the 2nd; heavy sleet in the northwest portion of the State on the 8th; 3.50 inches of rain fell on the 14th and 15th at Austin.

Thunder-storms.—On the 8th at Carrollton, Fortescue, Glasgow, Kansas City (1), Liberty, Oregon, Platte River, Protem and Sarcoxie; on the 9th at Kansas City (2·(Protem and Steelville.

SOLAR HALO.—Platte River, 21st.

LUNAR HALOS.—Columbia, Conception, Fortescue, Kidder, LaMonte, on 21st; Cairo, 26th; Fayette, 22nd; Kansas City (1), 22, 23, 24; Oregon, 21, 24, 25; Platte River, 6, 21.

METEORS.—Kansas City (2), 12th; Oregon, 5th and 13th.

AURORA.—Austin, 21.

December.

The temperature was about 7° above the normal for the State, while the rainfall ranged from about normal in the southern portion to two inches below the normal in the northern portions.

SUMMARY.

PRESSURE (in inches).—Monthly mean 30.172; highest, 30.643 on the 12th at Leavenworth; lowest 29.385 on the 31st at Glasgow.

TEMPERATURE (in degrees Fahr)—Monthly mean 36.2; highest monthly mean 42.1 at Dadeville; lowest monthly mean 27.8 at Pickering; maximnm 76 on the 1st at Protem; minimum 3 below zero on the 8th at Cassville; range for the State 79; greatest local range 74 at Protem; least local monthly range 40 at Austin.

PRECIPITATION (in inches).—Monthly mean 1.06; greatest 2.91 at Cairo; least trace at Conception and Pickering. Average amount of unmelted snow 4.6; greatest 12.0 at Hermann.

THUNDER-STORMS.—General thunder storms all over the State on the 31st.

SOLAR HALOS.—Fayette, 15th; Springfield, 22d.

LUNAR HALOS.—Cairo 21st, 22d, 30th; Fayette 20th; Kansas City 23d and 25th; Oregon 4th, 6th, 9th, 14th, 18th, 19th, 20th, 23d, 25th, 26th; Springfield 22d.

AURORA.—Appleton City 29th.

METEORS.—Oregon 18th; Warrenton 17th, 18th. A meteor about the size of the moon was witnessed by Mr. and Mrs. Wm. Kaucher, Judge O'Fallon, Mr. Nickerson and others at Oregon on the 18th.

LIST OF VOLUNTARY OBSERVERS FOR 1890.

Station.	County.	Observer.
Adrian*	Bates	Dr. H. W. Tuttle
Annapolis	Iron	Mr. Edwin May
Appleton City*	St. Clair	Prof. Louis Theilmann.
Austin	Cass	Dr. D. H. Webster
Boonville	Cooper	
Bethany	Harrison	Newburn & Co
Bradleyville	Taney	J. H. Lawrence
Brunswick*	Chariton	Louis Benecke, Esq
Cairo, Illinois†		E. J. Glass, Weather Bureau
California	Moniteau	Judge R. Q. Roache
Cape Girardeau	Cape Girardeau	W. D. Vandiver
Carrollton *	Carroll	Messrs. Pettit & Welch
Carthage	Jasper	Prof. J. G. Reaser, Prof. D. C. Hanna.
Centreville *	Reynolds	Dr. Murdoch McKenzie
Cassville*	Barry	Mr George E. Harris
Columbia †	Boone	A. L. McRae. Weather Bureau
Conception	Nodaway	Fr. Paul, O. S. B
Concordia	LaFayette	Mr. Henry Miller
Craig	Holt	Mr. Charles F. A. Day
Dadeville*	Dade	Major. Wick Morgan
Darksville*	Randolph	Mr. W. H. Broaddus
Dunnegan	Polk	Mr. H. M. Wollard
Eldon	Miller	Mr. Samuel Newton
Excelsior Springs	Clay	Mr. A. Reinisch
Fayette*	Howard	Prof. T. Berry Smith
Fortescue	Holt	Prof. Samuel M. Ruley
Fox Creek	St. Louis	Mr. William Muir
Frankford	Pike	Mr. W. W. Vermillion
Glasgow*	Howard	Prof. C. W. Pritchett
Glenwood *	Schuyler	Miss Maud Rippey
Gordonville	Cape Girardeau	Mr. L. M. Bean
Grand Pass*	Saline	Mr. E. R. Graham
Hannibal	Marion	Mr. C. L. Hixson
Harris	Sullivan	Prof. Charles C. Swafford
Harrisonville	Cass	Mr. A. J. Sharp
Hermann	Gasconade	Mr. Charles Maushund Mr. S. W. Maushund
Ironton	Iron	Mr. W. H. Delano
Jefferson Barracks *	St. Louis	Major D. G. Caldwell, U. S. A.
Jefferson City	Cole	Mr. J. C. Halligan
Jerome	Phelps	Mr. Charles Hutchison
Kansas City (1) †	Jackson	P. Connor, Weather Bureau
Kansas City (2)*	Jackson	Mr. S. J. Spurgeon
Keokuk, Iowa†		Mr. F. Z. Gosewisch, Weather Bu.
Kidder (1) *	Caldwell	Mr. S. S. Stahl
Kidder (2)	Caldwell	Mrs. J. E. Emerson
Kirksville	Adair	Mr. Charles Patterson
Laddonia	Audrain	Mr. D. W. Hughes
Lamar *	Barton	Prof. Jas. K. Hull
Lamonte (1)	Pettis	Mr. John S. Slaven
Lamonte (2)	Pettis	W. D. Wade
Langdon	Atchison	Miss Ida L. Joslyn
Leavenworth, Kas†		R. Peters, Weather Bureau
Lebanon	Laclede	Mr. M. W. Serl

LIST OF VOLUNTARY OBSERVERS—Continued.

Station.	County.	Observer.
Liberty*	Clay	Prof. J. R. Eaton
Louisiana Bridge	Pike	Mr. H. J. Stephenson
McCune Station	Pike	Mr. M. W. Wood
Marshall (1)*	Saline	Dr. W. H. Black, LL. D.
Marshall (2)	Saline	Mr. E. R. Graham
Marshfield*	Webster	Fred. King, Esq
Miami (1)	Saline	J. F. Webster
Miami (2)	Saline	Dr. A. W. Sullivan
Mine LaMotte*	Madison	Mr. J. D. Sanders
Nevada*	Vernon	Prof. W. A. Buckner
New Frankfort	Saline	Mr. G. W. Hawkins Mrs. M. E. Sydenstricker
New Haven	Franklin	Mr. Max Eimbeck
Oak Ridge	Cape Girardeau	Mr. Henry Bruihl
Oregon*	Holt	Mr. William Kaucher
Ozark	Christian	Mr. B. C. Y. Brown
Pickering*	Nodaway	Mr. M. B. W. Harman
Platte River	Buchanan	Mr. W. A. McDowell
Princeton	Mercer	Dr. William Hirons
Protem*	Taney	Dr. Silas C. Turnbo
St. Charles (1)	St. Charles	Dr. J. R. Mudd
St. Charles (2)*	St. Charles	Mr. Louis C. Saeger
St. Joseph	Buchanan	
St. Louis (1)†		Mr. W. H. Hammon, Weather Bu
St. Louis (2)*		Mr. F W. Duenckel
St. Louis (3)*		Prof F. E. Nipher
Sarcoxie*	Jasper	Mr. C. B. Armstrong
Sedalia*	Pettis	Mr. Charles G. Taylor
Shelbina	Shelby	Mr. John S. Chandler
Springfield†	Greene	T. S. Collins, Weather Bureau
Steelville	Crawford	Capt. E. A. Pinnell
Thayer*	Oregon	Mr. Percey W. Moss, Jr
Troy	Lincoln	Dr. I. A. Ward
Warrensburg	Johnson	Prof. Geo. L. Osborne
Warrenton	Warren	Prof. J. H. Frick
Willow Springs*	Howell	Capt. William Hughes
Windsor*	Henry	Mr. G. W. Goodlett
Withers' Mill	Marion	Mr. J. R. Dudley

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† Weather Bureau stations.

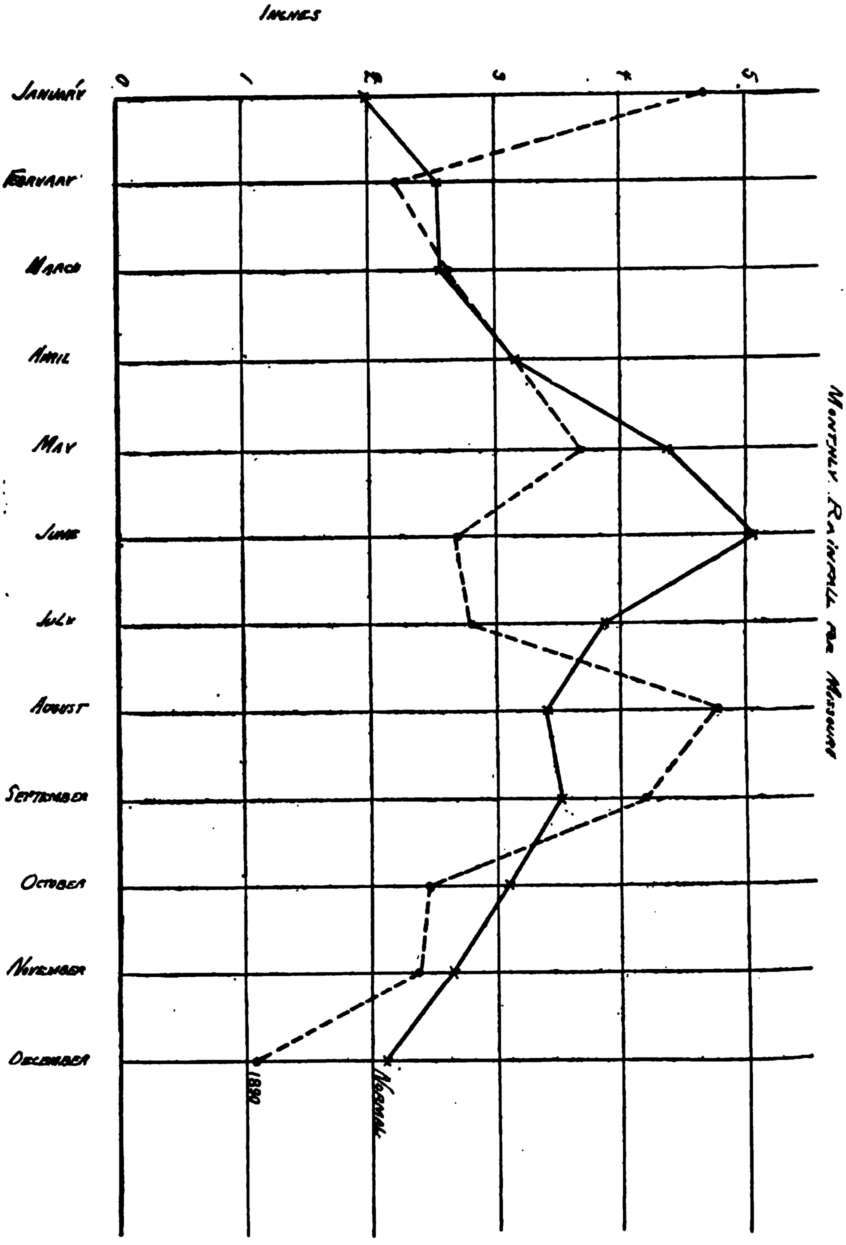
* Self-registering instruments.

MONTHLY AND ANNUAL PRECIPITATION FOR 1890.

Station.	January....	February....	March.......	April.......	May.........	June........	July........	August......	September ..	October.....	November....	December ...	Annual......
Adrian	....	....	....	....	....	4.17	1.78	5.26	3.86	2.45	3.03	0.76	....
Annapolis	10.05	5.80	7.40	7.20	2.40	2.00	2.00	2.90	6.40	0.40	4.00	0.50	51.05
Appleton City	4.78	2.05	2.20	3.70	7.77	3.34	....	5.54	4.24	2.59	2.25	1.02	....
Austin	....	....	....	....	....	1.95	3.75	8.20	4.65	3.50	4.70	0.75	....
Boonville	2.81	2.30	3.79	2.89	3.05	2.48	3.95	3.19	4.83	1.64	1.51	0.32	32.75
Bethany	3.00	1.50	1.00	1.83	2.87	3.75	4.03	9.67	1.79	3.45	1.60	0.75	35.24
Bradleyville	....	....	....	....	....	0.75	4.00	13.00	10.50	5.01	6.10	2.72	....
Brunswick	2.25	1.20	2.20	1.90	1.50	2.65	4.00	7.10	5.50	4.65	2.90	0.70	36.55
Cairo, Ill	6.32	7.57	6.14	3.76	4.19	1.45	1.62	5.16	2.29	3.04	6.08	2.91	50.53
California	....	....	....	....	8.50	1.50	0.00	13.50	13.50	1.60	4.60	0.50	....
Cape Girardeau	....	....	....	....	....	....	....	....	4.77	2.11	4.02	1.87	....
Carrollton	....	....	....	....	....	....	4.92	5.14	2.08	5.19	3.06	1.57	....
Carthage	6.67	2.23	1.08	....	7.88	3.96	2.50	....	....	3.97	1.99	1.15	....
Cassville	....	....	....	....	8.09	2.12	3.94	8.44	6.77	5.13	2.84	1.98	....
Centreville	10.05	5.04	8.20	6.51	3.93	1.80	3.70	1.17	8.07	1.20	3.58	1.67	54.92
Columbia	4.02	2.34	2.80	2.17	3.92	3.40	4.97	5.47	3.97	2.10	2.34	0.38	37.88
Conception	3.32	1.04	0.82	1.03	1.18	2.70	2.15	6.28	2.70	3.23	1.90	1.00	26.65
Concordia	....	....	....	....	....	....	3.50	2.12	2.12	2.50	2.75	0.50	....
Craig	2.23	0.35	0.77	0.00	1.15	1.80	....	....	....	....	....	....	....
Dadeville	....	....	....	....	....	....	....	4.91	5.77	4.15	2.11	1.02	....
Darksville	....	....	....	....	....	....	1.53	2.13	2.46	....	....	....	....
Eldon	....	....	....	....	4.38	1.37	4.00	9.00	6.63	0.88	2.13	0.63	....
Excelsior Springs	2.21	0.71	1.10	3.10	3.19	4.25	3.58	5.04	5.24	4.05	2.95	1.15	36.57
Fayette	2.96	1.51	2.73	2.17	2.76	2.37	3.01	3.21	2.35	2.30	1.83	.40	26.60
Fortescue	....	....	....	....	....	....	....	....	....	1.04	1.13	.31	....
Fox Creek	8.05	2.30	5.70	4.65	3.15	1.60	1.45	1.65	2.65	.88	1.53	2.15	35.26
Frankford	2.47	1.89	3.30	1.82	2.27	....	....	....	....	....	....	....	....
Glasgow	2.35	1.68	2.41	2.22	2.48	1.59	2.91	3.84	4.48	2.65	2.41	.95	29.97
Glenwood	....	....	....	....	....	3.77	2.78	4.57	5.20	....	1.54	....	....
Gordonville	....	....	....	....	....	....	....	....	....	.90	1.60	2.40	....
Grand Pass	2.10	.89	1.77	2.19	2.27	1.78	4.73	5.60	2.17	4.13	2.48	1.10	31.21
Hannibal	.85	.32	2.25	1.88	....	3.50	....	....	2.50	1.25	1.80	.12	....
Harris	1.62	.78	....	....	....	....	....	....	....	....	....	....	....
Harrisonville	2.35	.35	1.66	1.63	5.25	2.35	1.42	4.19	3.53	2.37	3.46	.53	29.09
Hermann	6.31	2.00	4.44	2.16	2.78	3.27	2.14	2.60	2.98	.48	1.12	.64	30.92
Ironton	10.50	5.00	8.45	7.00	3.75	1.40	6.85	5.55	8.40	1.50	3.55	1.20	63.45
Jefferson Barracks	6.30	3.85	4.51	4.72	3.75	1.22	1.17	3.50	2.40	.90	2.10	.90	35.32
Jefferson City	....	....	....	....	....	....	....	....	....	1.05	1.81	.54	....
Jerome	5.27	3.14	2.12	2.34	....	1.08	.90	6.45	2.68	.51	1.05	1.10	....
Kansas City (1)	1.49	.53	1.15	2.61	3.31	1.94	1.96	6.60	3.85	5.08	2.67	.63	31.82
Kansas City (2)	2.19	.83	1.50	2.73	3.50	2.00	3.36	6.67	3.98	4.71	2.78	.40	34.65
Keokuk, Iowa	1.81	1.09	2.43	1.79	3.34	3.41	2.49	1.77	4.46	2.44	1.87	.03	26.93
Kidder	1.86	.70	....	....	....	....	4.20	3.07	3.36	4.02	1.90	....	....
Kirksville	1.60	.50	2.00	1.25	1.90	4.58	1.60	3.48	3.95	3.68	....	....	....
Laddonia	....	....	....	2.00	1.30	1.70	1.70	1.00	1.12	.90	1.80	.40	....
Lamar	....	....	....	....	7.19	1.50	4.52	7.88	5.78	2.94	....	....	....
LaMonte (1)	2.01	....	....	2.40	1.14	.37	....	1.63	....	1.02	1.48	.50	....
LaMonte (2)	2.65	....	1.55	1.25	2.49	.97	6.10	3.73	2.12	1.75	2.13	1.00	....
Langdon	2.17	.30	.20	0.00	1.80	1.56	2.15	3.95	2.85	1.35	1.00	0.00	17.13
Leavenworth, Kan	1.27	.54	1.00	2.23	4.10	1.93	1.61	5.85	3.81	3.86	2.77	.40	29.37
Lebanon	....	....	....	....	....	....	....	....	5.96	2.07	2.28	2.65	....
Liberty	....	....	....	....	....	....	....	....	4.65	3.46	2.65	1.81	....
Louisiana bridge	3.37	1.14	2.16	1.77	2.94	2.78	0.48	1.67	2.36	3.07	1.45	0.21	23.40
McCune Station	....	....	....	....	....	0.00	0.00	0.50	2.41	1.08	1.19	0.85	....
Marshall (1)	....	....	....	....	....	....	....	....	....	....	....	0.80	....
Marshall (2)	....	....	....	....	....	....	....	....	2.56	2.71	2.97	....	....

MONTHLY AND ANNUAL PRECIPITATION FOR 1890—Continued.

Station.	January....	February....	March	April........	May........	June	July	August......	September..	October....	November..	December...	Annual .....
Mexico	4.65	1.97	2.87	3 11	2.31	3.15	3 61	1.76	4.21	1.45	2.06	0.27	31.42
Mine LaMotte	10.40	5.10	8.30	6 40	3.70	1.30	2 60	5 60	5.20	0.80	3 60	1.40	54.40
Miami (1)............	2.39	1.24	...	2.42	...	...	4.54	9.28	3.80	4 21	3.31	0.76	.....
Miami (2).....	2.34	1.24	2.25	2.13	2.61	4.95	1.99	7 60	3.80	3.55	2.85	0.35	35.66
Nevada...............	.....	...	.....	....	.....	...	1.77	6.11	3 53	. .	.	....	.....
New Frankfort	2.90	2.20	....	...	2.80	1.85	6 30	5.63	5.38	3.30	...	...	.....
New Haven...........	10.50	7.00	6.30	3.85	3.00	3.15	1.75	2.85	2.30	0.40	1 60	0.70	43.40
Oak Ridge............	9.90	6 50	14.20	6.95	3.50	.00	1.70	3.65	5.90	2.00	3 90	2.08	61.28
Oregon	3.53	0.95	1 32	1.31	2.22	3.03	8.03	2 93	3.53	1.86	1.36	0.32	25.39
Ozark................	4.50	2.70	3.80	2.30		...	...	..	...	...	...	....	.....
Pickering............	...	...	....	....	6.50	8.25	2.12	5.50	1.95	2.07	0.89	T	.....
Platte River.........	.....	...	....	...	...	..	..	3.77	3.03	3 09	1.56	2.05	.....
Princeton............	3 25	0.75	1.69	2.15	6.05	7.57	3.55	4 85	2.35	4.90	1.50	1.00	39.61
Protem	7.37	5 32	6.78	5.71	4.08	2 18	1.84	5.73	12.08	2.28	3.38	2.15	58.90
St. Charles (1)	9.30	2.70	3.70	3.00	3.20	2 70	0.20	3.60	1.75	0.85	1.00	0 90	32.90
St. Charles (2)	9.30	1 32	4 17	4.23	3.10	2.74	1.10	3.67	2.10	1.55	1 56	1.54	36.38
St. Joseph...........	2.85	0.45	0.85	2.12	2.52	5 97	1.12	3.12	3.12	2.99	1.27	0 03	26.41
St. Louis (1)	7.47	2.86	5.99	4.05	5 81	3.18	0.37	2.43	1.80	0.86	1.55	1 32	37.69
St. Louis (2)	....	...	..	..	..	...	...	...	....	0.99	2.87	1.18	.....
St. Louis (3).........	9.36	2.08	5.69	4.12	5.57	3.48	0.21	2.44	1.81	0.76	1 40	1.58	38.50
Sarcoxie.......	'.		....	....	3.53	4.90	4 87	15.39	14.41	4 05	2.89	1 20	.....
Sedalia	3.68	1.76	1.74	2 20	4.27	1 11	5.50	3.37	2.71	2.07	1 89	1 75	32.05
Shelbina	2 60	0 50	2.70	2.60	2 10	3.30	2.50	1.70	2.60	3.40	2.40	1.70	28.10
Springfield	5.51	5.22	4.23	3 57	3.81	1.33	4 25	8.21	8.11	3.97	2.41	1 95	52.57
Steelville	7.00	2.45	4 50	5.71	1.61	2 60	1.20	6.20	3 95	1.33	0.83	1.35	38.73
Thayer...............	...	...	7.89	...	3.78	...	...	...	....	...	...	....	.....
Troy.....	5 75	2.85	5.30	5 10	...	...	...	....	....	...	...	...	.....
Warrensburg	2 57	1.27	2 03	1.51	3.76	1.00	3.06	6.69	2 56	2.25	2.92	1.33	30.95
Warrenton............	....		3.40	4.05	3.70	2.26	1 48	2.48	2.20	0 89	1.22	0.66	....
Willow Springs.......	9.56	4.58	6.92	5.80	2.32	1.69	3.65	4.75	6 83	2.65	4.40	1.02	54.17
Windsor.............	5.85	0 40	3 80	9 20	7.10	7.60	6 60	5 50	2.14	1 84	1 80	0 58	52.41
Withers' Mill........	2.50	1.00	3.17	2.30	2 85	3.95	1 45	1.10	2.45	2.10	1.90	1.00	25.77
Number of stations.	59	57	56	57	61	66	68	70	75	78	76	74	44
Means.......... ..	4.65	2.21	2.61	3 17	3 67	2.66	2 78	4.75	4.22	2.45	2.37	1.03	37.36


Inches
0
1
2
3
4
5
January
February
March
April
May
June
July
August
September
October
November
December
1880
Normal
Monthly Rainfall for Missouri

RAINFALL DATA.

ATHENS, CLARK COUNTY.

Year.	January.....	February.....	March	April.........	May..........	June..........	July..........	August	September ..	October.....	November....	December....	Annual......
1864.........	0 94	0.48	1.09	4.24	1.65	1.26	3.22	.....	.....	.. ..	.....	2.10	......
1865.........	0 10	5.11	4.55	6.33	.....	2 81	.....	1.70	2.96	4.95	2.75	0.75	......
1866.........	2.86	3.70	3.56	3.62	0.73	2.50	4.69	.....	.....	.....	.....	.....	......

COLUMBIA, BOONE COUNTY.

H. J. Waters.

1886.........	.....	.....	.....	.....	.. .	.....	.....	4 33	5.33	1.10	1.69	0.37	......
1887.........	1.10	2.38	1.10	4.00	4.10	5.65	1.46	2.13	4.35	.....	.....	.....	......
1888.........	.....	.....	5.70	0.74	4.90	2.85	3.50	.....	.....	.....	.....	.....	......

FOX CREEK, ST. LOUIS COUNTY.

Wm. Muir.

1887.........	.....	.....	.....	.....	.....	.....	.....	.....	3.00	1.27	3.90	3.15	......
1888.........	1 77	2.33	2.94	1.47	3.66	5.60	2.27	4 13	1.19	3.76	3.31	2.54	34.97
1889.........	3.35	3.66	1.65	1.38	3.70	3.15	2 58	0.64	4.95	1.75	3 27	2.09	32.17
1890.........	8.05	2.30	5.70	4.65	3.15	1.60	1.45	1.65	2.65	0.38	1.53	2.15	35.26

MINE LA MOTTE, MADISON COUNTY.

J. D. Sanders.

1888.........	2.60	3.00	3 30	1.70	4.90	6.60	2.40	6.80	1.90	2.60	5.70	2.60	44.10
1889.........	3.00	2.70	2.40	2.10	3.80	4.40	6.80	0.40	3.00	1.70	4.40	1.90	36.60

NEOSHO, NEWTON COUNTY.

1880.........	....	....	....	....	....	....	....	....	....	....	....	....	57.25
1881.........	....	....	....	....	....	....	....	....	....	....	....	....	55.25
1882.........	....	....	....	....	....	....	....	....	....	....	....	....	60.25
1883.........	....	....	....	....	....	....	....	....	....	....	....	....	70.75
1884.........	....	....	....	....	....	....	....	....	....	....	....	....	55.00
1885.........	....	....	....	....	....	....	....	....	....	....	....	....	50.25
1886.........	....	....	....	....	....	....	....	....	....	....	....	....	31.75
1887.........	0.60	3.12	2 80	3 50	5.00	5.00	5.00	8.00	6 00	3.25	3.25	5.00	50.42
1888.........	2.72	2.25	2.60	3.50	6.25	9.75	1.75	0.75	1.50	4.75	1.75	3.25	40.82
1889.........	4.80	5.12	4.25	3.25	....	....	....	....	....	....	....	....	......

CHILLICOTHE, LIVINGSTON COUNTY, MO.

W. C. Wood.

Year.	January....	February....	March......	April.......	May.........	June.........	July.........	August.......	September..	October.....	November..	December..	Annual.....
1884.........	1.20	0.80	1.05	5.10	3.25	27.50	11.00	8 00	9.75	4.50	3.50	4.50	80.15
1885.........	3.00	3.95	1.05	7.25	5.75	12.00	5 00	4.00	6 50	4.50	1.00	1.50	55.50
1886.........	1 70	1.70	3 30	6 05	7.50	5.00	0 25	5.00	14 00	8.25	1.80	0 25	54 80
1887.........	8.62	1.40	2.55	6.50	1.50	8 00	2.75	7.00	12.50	3.00	2 20	3 90	59.92
1888.........	3.60	2.60	5 55	3.00	18.75	16.50	5.50	4.75	1 25	3.00	0.60	1.32	66.42
1889.........	1 62	3 65	1.50	6.25	10.50	5 75	7.50	1.00	12.00	0.00	6.25	0.25	56.27
1890.........	3 80	1.00	1.50	4.50	4 75	2.25	6.00	9.25	5.00	9.50	4.50	3.50	55 55
Sums	23.54	15 10	16.50	38 65	52 00	77.00	38.00	39 00	61.00	32.75	19.85	15.22	428.61
Means.....	3.36	2.16	2.30	5 52	7.43	11.00	5.43	5.57	8.71	4.68	2.84	2.17	61.23

MEAN TEMPERATURE—CHILLICOTHE, MO.

W. C. Wood.

1884.........	42.0	29.0	34.0	48.0	46.0	74.0	85.0	73.0	77.0	65.0	41.0	38.0	......
1885.........	35.0	23.0	34 0	50.0	59.0	71.0	82.0	73 0	70.0	57.0	45.0	30.0	......
1886........	20 1	30 3	49.0	49 0	66.0	78.0	85 0	79.0	74.0	57.5	41.0	36.0	......
1887.........	37 0	35 0	48.0	57.0	71.0	74.0	85 0	76.0	71 0	55.0	32.0	35.0	.....
1888.........	16.0	33 4	36.0	59.0	62 0	75 6	82.0	78.0	64.0	64.0	43.3	42.2	......
1889.........	31.0	31.0	42.0	55 0	62.0	63.0	77.1	76 0	67.0	55.0	42.0	46.3	......
1890	29.7	34.0	42.6	62.6	62.2	76.6	88.7	76.3	65.0	55.0	52.0	35.7	.....

NORMAL MONTHLY AND ANNUAL PRECIPITATION FOR MISSOURI

At Stations having six to nine years of Observations.

Station.	County.	No. of years record	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Allenton	St Louis	6	2.25	2.64	4.94	3.46	4.55	4.13	3.79	3.62	3.76	2.56	2.91	2.63	41.24
Bolivar	Polk	7	1.32	2.86	2.34	2.92	4.78	4.37	3.00	2.60	2.17	3.66	3.27	2.70	36.05
Conception	Nodaway	6	2.29	1.48	1.60	2.54	3.82	4.13	2.39	4.28	3.44	2.90	1.23	0.81	30.91
Chamois	Osage	8	1.62	3.52	1.95	3.11	3.94	5.11	2.55	1.76	4.41	3.33	3.31	2.04	36.65
Edina	Knox	7	1.74	1.35	2.30	3.81	1.94	3.88	3.31	2.12	4.63	1.82	1.18	2.40	30.48
Frankford	Pike	7	1.81	1.90	2.82	2.36	4.27	6.35	5.15	3.27	3.60	2.44	2.12	1.78	37.87
Glasgow	Howard	8	1.27	2.56	2.11	2.57	3.62	5.34	4.33	2.17	4.23	3.94	1.96	1.96	36.06
Greenfield	Dade	9	1.14	2.06	1.46	2.98	4.35	4.00	4.91	2.97	3.46	2.95	1.67	1.92	33.96
Hannibal	Marion	9	1.13	1.69	2.20	2.16	4.37	4.84	2.54	1.98	2.46	3.73	1.93	1.35	30.38
Jefferson City	Cole	7	2.66	2.27	3.31	2.88	3.49	3.44	3.24	1.79	2.22	1.78	1.99	1.76	30.83
Macon City	Macon	6	1.09	2.26	2.36	2.03	4.77	5.93	3.62	2.57	2.89	4.55	2.17	1.48	35.72
Phelps City	Atchison	6	0.77	1.19	1.96	2.89	3.44	6.87	3.02	3.38	2.56	2.52	1.60	1.23	31.43
Peirce City	Lawrence	9	1.90	4.06	2.59	3.81	4.55	5.32	5.48	4.30	3.23	4.55	3.28	2.76	45.83
Pleasant Hill	Cass	8	1.30	2.29	1.60	3.25	3.66	4.86	4.12	2.50	3.34	3.46	2.09	1.78	34.25
Protem	Taney	9	3.12	5.14	4.07	4.15	6.37	4.65	5.21	6.02	4.93	4.46	4.12	3.48	55.72
Savannah	Andrew	7	1.17	1.78	1.52	3.10	5.33	5.00	3.76	4.06	3.15	4.01	2.53	1.32	36.73
St. Louis	City	9	1.71	3.15	2.37	3.15	3.61	4.58	2.37	2.18	3.11	2.95	3.41	2.33	34.92
Steelville	Crawford	6	3.15	2.54	2.20	3.03	3.95	4.64	2.22	2.40	3.39	2.00	2.54	2.20	34.26
Mean of 18 stations			1.75	2.49	2.43	3.01	4.16	4.86	3.61	3.00	3.39	3.20	2.41	2.00	36.29

NORMAL MONTHLY AND ANNUAL PRECIPITATION FOR MISSOURI

At Stations having ten years or more of Observations.

Station.	County.	No. of years recorded....	January.....	February....	March.......	April........	May.........	June	July.........	August	September ..	October......	November...	December...	Annual......
Boonville	Cooper	14	1.68	3.00	2.89	3.01	5.04	6.16	3.92	2.63	4.35	3.27	2.34	1.82	40.11
Brunswick	Chariton	10	1.28	1.53	1.89	2.99	4 32	6.50	4.52	4.26	4.13	3.62	1.92	1.37	38 33
Cairo, Ill	Mississippi	19	1.12	4.19	3.84	3.94	3.83	4.51	3.54	2.88	2.58	2.96	4.23	3.26	43.86
Carthage	Jasper	12	4.22	2.94	2.12	3.47	4.58	4.90	4.68	3.68	2.91	3.96	2.24	2.13	39.83
Centreville	Reynolds	11	2.93	4 10	3.32	3.28	4.09	5.09	4.39	3.49	3.23	2.60	4.22	2.88	43.62
Corning	Holt	13	0.88	1.22	1.74	2.72	4.04	5.34	3.56	2.97	2.90	3.08	1.56	1.17	31.18
Glasgow	Howard	13	1.37	2.21	2.07	2.48	3.94	4.88	3.62	2.56	4.35	3.23	1.80	1.90	34.41
Harrisonville	Cass	14	1.50	2.33	2.30	3.49	4.49	4.41	3.51	4.19	4.38	2.76	2.35	2.08	37.79
Hermann	Gasconade	16	2.12	2.64	3.40	3.04	4.10	4.80	3.56	2.93	3.79	2.24	3.25	1.77	38.64
Ironton	Iron	13	3.26	3.85	3.28	3.35	4.84	5 01	4.30	3.37	3.62	2.97	4.66	3.19	45.70
Jefferson Barracks	St. Louis	26	2.29	2.55	2.86	3.27	4.39	4.67	4.44	3.61	3.04	3.19	3.44	2.22	39.97
Kansas City	Jackson	17	1.16	1.60	2.09	3.05	4.18	5.01	3.61	4.24	3.90	3.57	2.20	1.34	35.95
Keokuk, Ia	Clark	19	1.67	1.82	2.16	2.80	4.12	4.99	4.51	3.03	3.84	3.24	1.95	2.00	36.13
Kirksville	Adair	12	1.25	1.81	1.88	2.13	3.54	4.69	3.37	3.25	2.96	3.46	1.65	1.23	31.22
Lamar	Barton	10	1.46	2.84	2.11	3.40	4.78	3.98	4.02	4.74	4.21	3.14	2.01	2.16	38.84
Leavenworth, Kas	Platte	19	1.30	1.48	2.24	3.22	5.31	5.31	4.34	4.04	3.74	3.26	2.40	1.52	38.16
Lexington	Lafayette	10	1.48	2.26	1.59	2.81	3.92	5.66	4.54	2.96	4.23	3.26	2.01	2.06	36.78
Louisiana	Pike	12	1.65	2.64	2.24	2.40	3.65	4.58	1.97	2.35	3.10	2.69	2.38	2.00	31.65
Mexico	Audrain	13	1.96	2.64	2.38	2.88	4.03	4.58	3 18	2.64	4 03	2.37	2.68	2 21	35.58
Miami (1)	Saline	43	1.62	1.72	2.32	2.94	4.03	5.09	4.13	3.64	3.47	3.04	2.07	1.95	36.00
Miami (2)	Saline	13	1.64	2.33	2.18	3.07	4.45	6 61	4.48	4.03	4.23	3.54	2.27	2.02	40.85
Mine LaMotte	Madison	13	3.17	3.96	3.22	3.48	4.58	4.90	4.00	3.87	3.16	2.66	4.49	2.81	44.30
Oregon	Holt	35	1.68	1.77	1.97	3.40	4 48	4 84	4.46	4.17	3.14	2.80	1.80	1.61	36.12
Rolla	Phelps	10	2.34	2.83	3.41	4.35	4 59	4.03	5.16	3 46	3.27	2.42	2.28	2.26	40.40
St. Charles	St. Charles	13	2 40	3.49	2.57	2.73	3.69	4 34	2.60	2.80	2 57	2 49	3.12	1.95	34.84
St. Joseph	Buchanan	16	1.13	1.14	1.84	3.14	4.33	5.83	3 83	3.81	3.05	3.35	2.13	1.14	34.72
St. Louis city (1)		42	2.19	2.54	3.60	3.72	4.60	5 22	4.14	4 07	2.90	2.96	2.89	2.86	41.70
St. Louis city (2)		19	2 00	2.29	3.75	4.00	4 06	6.86	3.88	3 02	2 62	3 26	3 12	2.73	42.89
St. Louis city (3)		20	2 40	3.05	3.05	3.33	4.11	5 02	3.49	2 55	3.34	2.09	2.93	2 30	38.38

St. Louis city (5)		13	3.05	3.54	3.10	3.61	4.11	4.52	2.40	2.55	3.82	3.16	3.61	3.58	40.14
Sedalia	Pettis	13	2.00	2.36	2.44	2.95	4.63	5.23	3.69	2.08	4.23	3.01	1.98	1.97	36.57
Shelbina	Shelby	11	1.81	2.23	2.26	2.25	4.39	4.96	3.06	2.55	3.92	4.13	2.09	1.95	36.20
Springfield	Greene	12	2.04	3.29	2.90	4.02	5.90	5.25	4.33	4.30	3.16	3.23	3.42	2.51	44.35
Warrensburg	Johnson	14	1.68	2.27	2.22	2.71	4.06	4.84	3.06	3.71	3.08	2.95	2.06	1.91	34.05
Mean of 34 stations			1.96	2.54	2.57	3.16	4.36	5.05	3.85	3.39	3.51	3.08	2.63	2.09	38.18
Mean of 52 stations			1.89	2.52	2.52	3.11	4.29	4.98	3.77	3.26	3.47	3.10	2.56	2.05	37.53

MEAN RELATIVE HUMIDITY.

Per Cent.

CAIRO, ILLINOIS.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1871	....	....	....	....	....	....	.74	.75	.75	.70	.70	.66	.....
1872	.70	.70	.57	.56	.65	69	.75	.70	.74	.73	.64	.72	.68
1873	.73	.72	.58	.63	.75	.74	.55	.68	.71	.68	.62	.75	.68
1874	.72	.76	.73	.72	.66	.68	.71	.68	.69	.64	.65	.71	.69
1875	.75	.66	.62	.53	.61	.74	.80	.75	.74	.65	.74	.72	.69
1876	.69	.62	.67	.57	.65	.73	.75	.77	.72	.61	.65	.61	.67
1877	.71	.64	.60	.64	.62	.72	.72	.99	.74	.70	.68	.67	.68
1878	.74	.68	.57	.60	.68	.73	.72	.72	.71	.67	.67	.75	.69
1879	.73	.64	.63	.59	.62	.70	.70	.72	.73	.71	.66	.76	.68
1880	.74	.65	.64	.58	.67	.68	.72	.73	.74	.73	.72	.75	.70
1881	.77	.73	.65	.66	.73	.73	.66	.62	.71	.77	.74	.74	.71
1882	.82	.76	.70	.66	.72	.74	.75	.79	.78	.76	.74	.75	.75
1883	79	.77	.68	.66	.66	.74	.74	.72	.70	.79	.69	.70	.72
1884	.77	.75	.68	.66	.70	.83	.80	.74	.77	.75	.74	.79	.75
1885	.76	.66	.65	.62	.68	74	75	.73	.77	.73	.67	.66	.70
1886	.79	.67	.65	.66	.71	.76	.73	.76	.75	.68	.65	.74	.71
1887	.69	.75	.61	.58	.74	.71	.72	.64	.68	.62	.59	.71	.67
1888	.73	.72	.69	.52	.69	.76	.72	.79	.76	.73	.78	.75	.72
1889	.78	.69	.62	.59	.62	.78	.82	.80	.85	.79	.79	.73	.74
1890	.80	.77	.66	.69	.70	.76	.68	.77	.85	.79	.72	.74	.74
Sums	14.21	13.34	12.20	11.72	12.86	13.96	14.53	14.55	14.89	14.23	13.84	14.42	13.37
Means	.75	.70	.64	.62	.68	.72	.73	.73	.74	.71	.69	.72	.70

KANSAS CITY.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1888	....	....	....	....	....	....	.71	.79	.71	.68	.75	.74	.....
1889	.75	.74	.70	.72	.75	.77	.79	.77	.82	.70	.70	.78	.75
1890	.79	.72	.65	.66	.63	.63	.60	.70	.78	.71	.71	.66	.69
Sums	1.54	1.46	1.35	1.38	1.38	1.40	2.10	2.26	2.31	2.09	2.16	2.18	1.44
Means	.77	.73	.68	.69	.69	.70	.70	.75	.77	.70	.72	.73	.72

LAMAR, MO.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1885	....	....	.68	.69	.70	.78	.78	.77	.80	.69	.64	.72	.....
1886	.84	.71	.69	.74	.68	.70	.66	.71	.72	.70	.68	.75	.71
1887	.65	.75	.60	.54	.70	.68	.68	.73	.79	.69	.68	.75	.69
1888	.77	.77	.72	.64	.71	.79	.77	.81	.77	.76	.77	.78	.76
Sums	2 26	2.23	2.69	2.61	2.79	2.95	2.89	3 02	3.08	2.84	2.77	3.00	2.16
Means	.75	.74	.67	.65	.70	.74	.72	.76	.77	.71	.69	.75	.72

KEOKUK, IOWA.

Stations.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1871	....	....	....	....	....	....	....	.67	.65	.64	.75	.67	......
1872	.71	.68	.67	.61	.62	.64	.68	.70	.63	.64	.67	.68	66
1873	.74	.68	.58	.68	.67	.65	.70	.59	.66	.68	.68	.79	.68
1874	.78	.80	.69	.63	.59	.69	.61	.68	.76	.69	.70	.77	.70
1875	.76	.72	.68	.60	.62	.72	.76	.70	.69	.64	.68	.77	.69
1876	.72	.68	.73	.58	.64	.74	.74	.73	.76	.64	.76	.72	.70
1877	.77	.72	.79	73	.71	.72	.69	.70	.66	.71	.72	.77	.72
1878	.73	.75	.68	.63	.71	.73	.67	.67	.68	.63	.70	.78	.70
1879	.77	.70	.78	.58	.59	.68	.65	.67	.67	.64	.68	.72	.67
1880	.74	.65	.64	.58	.62	.68	.66	.64	.67	.64	.66	.74	.66
1881	.72	.74	.72	.70	.65	.72	.68	.58	.63	.80	.74	.79	.71
1882	.78	.70	.68	.66	.72	.74	.68	.73	.70	.72	.74	.76	.72
1883	.76	.71	.68	.62	.67	.72	.70	.71	.66	.74	.66	.70	.69
1884	.74	.78	.74	.66	.65	.75	.71	.68	.71	.72	.76	.82	.73
1885	77	.78	.70	.76	.69	.75	.72	.74	.75	.74	.76	.80	.75
1886	.87	.77	.76	.72	.72	.70	.60	.64	.70	.66	.71	.80	.72
1887	.79	.83	.72	.60	.66	.67	.60	.58	.65	.62	.63	.83	.68
1888	.74	.78	.71	.59	.71	.73	.78	.75	.72	.70	.76	.78	.73
1889	.82	.78	.68	.93	.67	.76	.74	.70	.76	.78	.81	.82	.75
1890	.86	.80	.75	.65	.68	.69	.60	.64	.72	.74	.72	.69	.71
Sums	14.57	14.05	13.28	12.21	12.59	13.48	12.97	13.50	13.81	13.77	14.29	15.17	13.87
Means	.77	.74	.70	.64	.66	.71	.68	.68	.69	.69	.71	.76	.70

LEAVENWORTH, KANSAS.

1871	....	....	....	....	....	.52	.55	.52	.43	.35	.42	.64	......
1872	.74	.72	.67	.62	.66	.61	.72	.66	.65	.59	.62	.67	.66
1873	.76	.68	.52	.64	.68	.69	.62	.56	.60	.59	.55	.70	.63
1874	.69	.73	.68	.62	.62	.68	.59	.56	.70	.67	.66	.70	.66
1875	.73	.74	.66	.55	.58	.60	.73	.69	.67	.59	64	.70	.66
1876	.71	.61	.73	.62	.66	.67	.70	.71	.67	.61	.73	.68	.68
1877	.79	.74	.71	.65	.70	.70	.69	.67	.58	.74	.73	.78	.70
1878	.72	.75	.65	.60	.68	.72	.72	.69	.65	.57	.62	.79	.68
1879	.75	.65	.57	.57	60	.67	.71	.59	.61	.65	.69	.67	.64
1880	.70	.62	.62	.53	.57	.63	.63	.64	.69	.63	.64	.70	.63
1881	.70	.76	.66	.63	.69	.68	.64	.56	.62	.75	.66	.66	.67
1882	.70	.64	.60	.62	.67	.67	.68	.69	.59	.69	.72	.74	.67
1883	.72	.73	.63	.54	.62	.72	.68	.72	.67	.73	.62	.66	.67
1884	.71	.65	.67	.67	.65	.72	.70	.73	.69	.70	.71	83	.70
1885	.85	.80	.71	.75	.70	.75	.76	.74	.75	.69	.68	.75	.74
1886	.76	.72	.71	.71	.74	.75	.66	.67	.67	.69	.65	.74	.71
1887	.70	.75	.62	.59	.65	.72	.65	.73	.74	.65	.65	.74	.68
1888	.74	.72	.68	.60	.64	.69	.69	.76	.71	.73	.81	.77	.71
1889	.82	.79	.72	.66	.69	.68	.71	.73	.80	.74	.75	.77	.74
1890	.80	.80	.74	.72	.73	.73	.64	.74	.78	.72	.74	.68	.74
Sums	14.09	13.60	12.55	11.89	12.53	13.60	13.47	13.36	13.27	13.08	13.29	14.37	12 97
Means	.74	.72	.66	.63	.66	.68	.67	.67	.66	.65	.66	.72	.68

ST. LOUIS, MO.

Year.	January....	February....	March	April.........	May..........	June	July	August......	September..	October	November ..	December...	
1871..........	.68	.67	.68	.60	.68	.73	.78	.68	.64	.59	.72	.65	.6
1872..........	.71	.66	.55	.53	.60	.60	.70	.60	.57	.54	.61	.63	.6
1873..........	.64	.63	.55	.60	.60	.66	.66	.58	.65	.63	.62	.74	.6
1874..........	.71	.75	.65	.58	.56	.57	.57	.63	.65	.60	.63	.68	.6
1875..........	.70	.70	.71	.51	.55	.71	.76	.67	.62	.53	.63	.69	.6
1876..........	.62	.62	.68	.51	.56	.67	.69	.73	.70	.53	.67	.63	.6
1877..........	.70	.64	.67	.64	.63	.69	.63	.64	.67	.70	.68	.71	.6
1878..........	.67	.66	.58	.56	.64	.62	.65	.65	.61	.62	.64	.76	.6
1879..........	.71	.67	.62	.53	.54	.63	.62	.63	.60	.63	.64	.76	.6
1880..........	.71	.64	.63	.57	.63	.69	.64	.63	.65	.62	.73	.76	.6
1881..........	.78	.78	.72	.67	.68	69	.61	.53	.62	.79	.70	.76	.7
1882..........	.78	.74	.69	.69	.84	.82	.78	.88	.77	.85	.90	.85	.8
1883..........	.83	.86	.84	.77	.82	.78	.73	.74	.65	.82	.66	.73	.7
1884..........	.73	.78	.74	.68	.68	.77	.74	.70	.71	.72	.72	.74	.7
1885..........	.74	.72	.64	.67	.67	.74	.75	.76	.75	.71	.72	.69	.7
1886..........	.76	.70	.69	.70	.72	.71	.66	.60	.61	.56	.61	.69	.6
1887..........	.67	.70	.60	.48	.62	.59	.57	.52	.61	.56	.54	.77	.6
1888..........	.75	.77	.71	.53	.66	.70	.67	.74	.70	.71	.77	.76	.7
1889..........	.76	.76	.71	.60	.66	.73	.69	.65	.72	.66	.76	.75	.7
1890..........	.78	.76	.66	66	.66	.65	.55	.64	.73	.68	.67	.70	.6
Sums	14.43	14.21	13.32	12.08	13.00	13.75	13.45	13.20	13.23	13.05	13.62	14.45	13.5
Means	.72	.71	.67	.60	.65	.69	.67	.66	.66	.65	.68	.72	.6

SPRINGFIELD, MO.

1882..........	.79	.74	.72	.63	.74	.70	.72	.73	.74	.75	.78	.76	.73
1883..........	.76	.72	.66	.62	.70	.....	.....	.....	.....	.....	.. .	.....	......
1887..........	.....	.....	.....	.....	.....	.....	.....	.....	.....	.68	.64	.80	......
1888..........	.78	.76	.72	.57	.67	.74	.72	.81	.76	.76	.82	.78	.74
1889..........	.81	.80	.76	.67	.74	.78	.78	.78	.82	.74	.79	.79	.77
1890..........	.83	.83	.70	.69	.70	.70	.71	.80	.86	.76	.70	.72	.75
Sums......	3.97	3.85	3.56	3.18	3.55	2.92	2.93	3.12	3.18	3.69	3.73	3.85	2.99
Means.....	.79	.77	.71	.64	.71	.73	.73	.78	.80	.74	.75	.77	.75

AVERAGE CLOUDINESS.

(In tenths.)

CAIRO, ILLINOIS.

Year.	January....	February...	March......	April......	May........	June.......	July........	August.....	September..	October....	November..	December..	Annual....
1871.........	.....	.....	.....	.....	.....	.....	4.7	3.1	2.5	4.0	5.9	4.9	.....
1872.........	6.0	5.5	5.5	5.5	5.5	5.5	5.2	5.5	6.0	6.0	8.2	9.2	6.1
1873.........	6.0	5.9	4.6	6.1	7.2	6.6	5.7	4.5	5.2	4.2	5.5	7.0	5.7
1874.........	7.5	6.9	6.2	6.0	4.2	3.7	3.7	4.2	4.6	3.2	5.9	6.3	5.2
1875.........	5.5	4.9	5.3	4.4	4.2	4.5	6.3	4.0	4.5	3.5	6.1	5.9	4.9
1876.........	4.5	3.6	6.4	4.7	5.1	5.1	3.9	4.5	4.2	3.3	6.3	4.5	4.7
1877.........	6.7	5.1	5.5	6.3	4.9	5.4	4.6	3.4	4.7	4.8	5.3	5.3	5.2
1878.........	5.5	6.4	3.5	5.2	5.3	5.3	3.8	3.5	3.2	4.3	5.1	6.8	4.8
1879.........	5.6	5.2	4.9	4.3	4.2	4.8	4.4	3.8	3.5	4.2	5.4	7.2	4.8
1880.........	5.7	4.7	6.1	4.3	3.4	4.5	3.4	3.8	5.0	4.7	6.2	6.3	4.8
1881.........	6.3	6.6	5.7	6.1	4.7	4.7	2.2	2.3	3.2	5.4	4.8	5.9	4.8
1882.........	7.1	6.3	4.9	4.9	6.3	4.8	5.4	4.6	4.0	4.7	6.0	6.1	5.4
1883.........	6.7	6.1	5.2	5.0	4.3	4.9	4.5	3.1	3.0	5.5	4.4	5.4	4.8
1884.........	5.9	6.4	6.0	6.1	4.7	5.4	4.4	2.6	3.5	2.8	3.7	7.3	4.9
1885.........	4.8	4.6	4.7	5.8	4.8	5.5	4.4	4.0	5.4	4.1	5.6	5.1	4.9
1886.........	6.3	4.6	6.8	6.2	4.9	6.1	3.9	4.7	4.3	2.5	5.0	6.3	5.1
1887.........	5.6	6.3	5.2	4.3	5.5	4.9	3.7	3.9	5.3	3.5	3.8	6.6	4.9
1888.........	5.6	6.1	5.8	3.7	5.8	6.1	4.4	6.0	2.8	4.8	6.1	5.2	5.2
1889.........	5.7	5.8	4.2	4.4	3.5	6.7	6.5	2.9	5.5	3.9	6.8	6.0	5.2
1890.........	7.6	7.2	6.4	6.1	4.7	5.6	4.1	5.9	6.5	5.4	4.3	5.0	5.7
Sums.....	114.6	108.2	102.9	99.4	93.2	100.1	89.2	80.3	86.9	84.8	110.4	122.3	97.1
Means.....	6.0	5.7	5.4	5.2	4.9	5.3	4.5	4.0	4.3	4.2	5.5	6.1	5.1

KANSAS CITY.

Year.	January....	February...	March......	April......	May........	June.......	July........	August.....	September..	October....	November..	December..	Annual....
1888.........	.....	.....	.....	.....	.....	.....	4.0	5.6	3.2	4.2	4.6	4.6	.....
1889.........	4.0	4.6	5.0	4.8	5.4	4.4	5.7	4.6	5.2	5.1	4.7	5.3	4.9
1890.........	6.0	6.2	5.6	6.5	5.4	4.0	3.6	3.9	5.6	4.6	4.1	4.1	5.0
Sums.....	10.0	10.8	10.6	11.3	10.8	8.4	13.3	14.1	14.0	13.9	13.4	14.0	9.9
Means....	5.0	5.4	5.3	5.6	5.4	4.2	4.4	4.7	4.7	4.6	4.5	4.7	5.0

KEOKUK, IOWA.

Year.	January....	February....	March......	April......	May........	June........	July........	August......	September..	October....	November..	December...	Annual....
1871.........	....	....	....	....	....	....	....	4.2	4.2	4.8	6.0	5.0	.....
1872.........	5.5	5.5	5.7	5.2	5.0	4.7	4.7	3.7	4.2	2.7	5.2	4.7	4.7
1873.........	5.2	4.2	4.2	6.2	6.5	4.7	4.5	3.7	3.7	3.5	5.5	6.5	4.9
1874.........	6.0	5.5	5.7	5.0	4.7	4.7	4.7	4.7	4.5	4.5	6.0	6.0	5.2
1875.........	5.8	5.5	5.7	4.5	4.0	5.2	5.8	3.3	3.8	4.8	5.0	6.5	5.0
1876.........	5.2	4.5	6.2	5.0	5.2	6.5	4.8	3.8	6.0	5.0	6.8	4.5	5.3
1877.........	5.2	4.2	5.5	6.0	6.2	5.2	4.2	3.0	3.0	5.7	6.0	5.2	5.0
1878.........	6.2	3.5	4.7	4.7	5.7	5.5	4.2	3.5	3.0	4.7	4.7	6.7	4.8
1879.........	5.5	5.7	5.5	3.5	5.5	5.2	4.7	5.0	4.5	3.7	6.0	6.5	5.1
1880.........	6.2	4.0	5.7	5.5	5.0	5.5	5.2	5.0	4.0	4.2	6.0	6.2	5.2
1881.........	7.0	7.0	6.7	6.0	5.0	6.0	3.0	3.0	3.7	6.0	5.0	5.3	5.3
1882.........	5.3	3.6	5.3	4.7	5.6	5.8	3.8	3.9	3.2	4.1	5.5	6.6	4.8
1883.........	5.4	5.2	4.8	4.2	5.1	5.0	3.8	3.9	3.0	6.1	3.9	4.4	4.6
1884.........	4.2	5.6	5.5	5.9	4.3	4.7	4.1	3.1	3.3	3.1	3.9	6.7	4.5
1885.........	4.7	3.8	3.8	6.5	4.4	5.0	4.1	4.4	4.4	4.0	4.9	4.5	4.5
1886.........	5.8	4.5	5.6	4.9	3.6	3.4	1.6	2.9	4.2	2.9	4.3	3.7	3.9
1887.........	4.6	6.0	4.4	3.9	4.2	3.7	2.7	4.1	4.6	3.2	3.3	4.7	4.1
1888.........	3.8	3.9	4.6	3.3	4.7	4.8	3.6	4.1	3.1	4.0	5.0	5.0	4.2
1889.........	4.6	4.4	4.6	4.2	4.4	4.0	4.0	2.3	4.9	3.9	4.4	5.5	4.3
1890.........	4.9	6.2	5.0	4.7	4.5	4.4	3.2	4.0	4.3	4.9	4.6	4.2	4.6
Sums.....	101.1	92.8	99.2	93.9	93.6	94.0	76.7	75.6	79.6	85.8	102.0	108.4	90.0
Means....	5.3	4.9	5.2	4.9	4.9	4.9	4.0	3.8	4.0	4.3	5.1	5.4	4.7

LEAVENWORTH, KANSAS.

1871.........	....	....	....	....	....	4.6	4.9	3.8	2.9	3.5	5.5	4.2	.....
1872.........	3.6	5.8	5.4	5.6	6.0	4.4	5.6	4.1	4.2	2.8	4.3	4.3	4.7
1873.........	4.9	4.3	5.0	6.3	6.2	5.4	3.8	3.0	4.4	3.5	2.9	5.9	4.6
1874.........	5.0	5.9	6.6	5.2	4.7	3.9	3.0	3.5	4.9	4.0	6.0	4.4	4.8
1875.........	4.8	4.8	4.1	4.9	4.3	3.4	5.8	3.4	4.0	3.8	4.6	5.0	4.4
1876.........	4.0	3.6	6.3	5.2	4.9	4.8	3.9	4.2	4.8	3.9	5.3	3.5	4.5
1877.........	5.3	5.0	5.8	5.7	6.8	4.4	4.1	3.7	3.9	6.3	5.6	6.3	5.2
1878.........	4.9	5.8	4.7	4.7	6.1	5.4	4.4	3.2	3.8	3.3	4.0	6.2	4.7
1879.........	5.2	5.0	4.8	5.3	5.4	5.6	4.9	3.9	5.2	3.7	4.5	5.4	4.9
1880.........	5.6	2.9	4.7	3.6	4.6	4.2	3.8	3.9	3.6	3.8	4.9	5.5	4.3
1881.........	5.8	5.9	4.0	5.3	6.3	4.1	3.3	3.7	4.5	6.3	4.4	5.6	4.9
1882.........	5.8	4.7	4.5	6.0	6.8	4.9	4.3	3.5	3.2	4.1	4.9	6.0	4.9
1883.........	5.2	5.0	4.8	4.4	4.7	4.4	3.8	3.8	3.6	6.1	3.0	4.4	4.5
1884.........	4.7	5.8	5.8	6.0	4.3	4.2	4.0	4.2	3.1	3.0	3.6	7.0	4.6
1885.........	4.0	4.7	3.9	6.1	4.2	5.5	4.3	3.7	3.9	3.7	4.9	5.1	4.5
1886.........	6.1	4.2	5.7	6.1	3.6	4.2	2.7	3.0	4.0	3.2	3.9	4.3	4.2
1887.........	4.4	5.6	3.9	3.9	4.5	4.1	2.6	4.8	5.1	2.8	3.5	4.2	4.1
1888.........	3.9	4.9	5.4	4.7	5.0	5.0	3.1	4.6	2.8	3.2	4.6	4.4	4.3
1889.........	4.0	4.8	4.7	4.7	5.3	4.0	4.2	3.0	5.0	4.9	4.2	5.5	4.5
1890.........	6.1	6.6	6.5	6.7	6.5	5.6	5.5	6.3	6.9	5.3	4.3	4.5	5.9
Sums.....	93.3	95.3	96.6	100.4	100.2	92.1	82.0	77.3	83.8	81.2	88.9	101.7	88.5
Means.....	4.9	5.0	5.1	5.3	5.3	4.6	4.1	3.9	4.2	4.1	4.4	5.1	4.7

LAMAR, MO.

Year.	January....	February ..	March......	April	May........	June	July.........	August.....	September...	October.....	November...	December...	Annual......
1885.........	.....	.....	5.1	6.0	5.7	6.4	4.4	3.6	4.4	4.4	4.5	4.7	......
1886.........	6.1	4.0	6.3	4.8	3.3	4.6	3.3	3.5	4.1	2.8	4.1	3.8	4.2
1887.........	4.1	5.2	4.3	3.9	4.5	3.7	2.3	5.2	5.8	2.7	3.1	5.1	4.1
1888.........	4.9	5.2	5.6	4.1	5.3	4.8	4.0	6.0	1.8	3.4	5.6	4.6	4.6
Sums.....	15.1	14.4	21.3	18.8	18.8	19.5	14.0	18.3	16.1	12.3	17.3	18.2	12.9
Means....	5.0	4.8	5.3	4.7	4.7	4.9	3.5	4.6	4.0	3.1	4.3	4.6	4.3

ST. LOUIS, MO.

1871.........	5.3	5.4	5.8	5.3	4.4	4.0	4.4	3.9	3.0	3.7	6.9	5.3	4.7
1872.........	5.5	5.1	5.4	4.8	6.3	5.6	6.4	4.1	3.9	2.4	5.3	5.4	5.0
1873.........	4.5	5.6	5.7	6.3	6.5	5.2	4.4	3.2	4.1	3.1	4.7	6.2	5.0
1874.........	4.9	5.8	5.0	5.4	5.2	4.4	4.4	4.6	4.3	4.3	5.7	6.3	5.0
1875.........	5.8	5.3	6.0	4.7	4.1	5.4	6.8	3.2	3.6	3.5	5.7	5.5	5.0
1876.........	4.4	4.0	6.0	4.1	4.8	5.7	4.0	3.8	4.9	3.7	6.2	4.8	4.7
1877.........	5.5	4.7	5.1	6.1	4.8	5.0	4.1	3.2	3.5	4.8	5.8	5.1	4.8
1878.........	5.7	6.3	3.9	5.2	5.7	5.2	3.8	4.0	3.0	3.8	4.8	6.6	4.8
1879.........	5.0	4.7	5.2	4.1	3.7	4.3	3.8	3.7	3.0	3.0	4.9	7.2	4.4
1880.........	5.4	3.4	5.5	3.8	3.1	4.8	3.3	2.9	3.7	4.0	5.6	6.2	4.3
1881........	6.5	7.2	6.0	5.5	5.0	5.2	3.2	3.3	4.2	5.6	4.9	5.6	5.2
1882.........	6.4	5.6	4.9	5.2	6.7	5.6	4.7	4.2	3.3	4.1	6.0	6.7	5.3
1883.........	6.3	5.5	5.4	4.7	5.2	5.0	4.1	3.3	2.9	6.4	4.1	5.1	4.8
1884.........	5.1	6.4	6.1	6.9	4.2	5.7	4.9	3.9	3.8	3.0	4.4	7.8	5.2
1885.........	4.5	4.5	4.5	6.0	5.1	5.7	4.4	3.8	4.7	4.1	5.1	4.6	4.7
1886.........	5.8	3.9	6.4	5.4	4.2	4.4	2.6	3.9	4.3	2.8	5.2	5.4	4.5
1887.........	4.3	6.5	4.6	4.2	4.8	3.7	2.8	3.8	4.8	3.1	2.8	6.3	4.3
1888.........	4.5	5.3	5.6	2.9	4.7	5.0	4.0	5.7	2.4	3.9	5.6	4.6	4.5
1889.........	5.0	4.3	4.0	3.2	4.5	4.2	5.1	3.3	5.4	4.6	6.3	5.0	4.6
1890.........	6.0	6.3	5.4	4.1	3.9	3.7	3.2	4.8	5.3	4.6	4.3	4.8	4.7
Sums......	106.4	105.8	106.5	97.9	96.9	97.8	84.4	76.6	78.1	78.5	103.4	114.5	95.5
Means....	5.3	5.3	5.3	4.9	4.8	4.9	4.2	3.8	3.9	3.9	5.2	5.7	4.8

SPRINGFIELD, MO.

1882.........	5.9	5.9	5.3	4.8	6.7	5.2	5.6	4.4	4.2	4.7	5.6	5.7	5.4
1883.........	5.7	5.6	5.5	4.2	4.9	....	.....	.....	.....	.....	.....	.....	......
1887.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.5	3.3	5.2	......
1888.........	4.5	5.3	5.5	3.6	4.5	4.4	3.6	5.6	2.3	3.6	6.1	4.9	4.5
1889	4.3	4.2	4.7	4.2	4.2	5.4	4.7	3.6	5.4	4.9	6.3	5.2	4.8
1890.........	6.6	7.0	5.8	5.9	5.0	4.1	3.9	5.2	6.3	4.5	4.2	4.3	5.2
Sums......	27.0	28.0	26.8	22.7	25.3	19.1	17.8	18.8	18.2	20.2	25.5	25.3	19.9
Means.....	5.4	5.6	5.4	4.5	5.1	4.8	4.4	4.7	4.6	4.0	5.1	5.1	5.0

PREVAILING WIND DIRECTION.

Stations.	January....	February....	March.....:	April.......	May.........	June	July...	August.......	September...	October......	November....	December....
Cairo, Ill....	S	N	S	S	S	S	S	S	S	S	S	S
Keokuk, Ia.	N W	N W	N W	S E	S	S	S	S	S	S	N W	N W
Leav'wth Ks	S	S	N	S	S	S	S	S	S	S	S	S
St. Louis....	N W	S	N	S	S	S	S	S	S	S	S	S

AVERAGE PRESSURE IN INCHES (actual).

Cairo, Ill ...	29.78	29.74	29.67	29.60	29 60	29.61	29.64	29.64	29.69	29.72	29.74	29.77	29.
Keokuk, Ia.	29.45	29.42	29.36	29.29	29.29	29 29	29.33	29.34	29.38	29.40	29.41	29.44	29.
Leav'wth Ks	29 25	29.20	29.15	29.07	29.06	29.07	29.11	29.12	29.15	29.18	29.20	29.24	29.
St. Louis ...	29.53	29.50	29.44	29.37	29.37	29.37	29.41	29.41	29.46	29.48	29.50	29.52	29.

AVERAGE HOURLY WIND VELOCITY.

Keokuk, Ia.	8.2	9.0	9.2	10.0	7.5	6.3	6.4	6.8	7.8	7.3	8.1	8.2	7.
Leav'wth Ks	7.0	7.3	7.8	8.3	6.7	5.7	5.4	5.5	6.0	6.0	6.3	6.8	6.
St. Louis....	12.3	11.4	12.2	12.6	10.5	8.9	7.8	7.9	9.6	10.3	11.5	11.8	10.

DEPTH OF EVAPORATION (in inches) FROM JULY, 1887, TO JUNE, 1888.

(From Signal Service Observation)

Cairo, Ill....	1.6	2.1	2.9	5.8	4.4	4.3	5.6	6.5	5.1	4.5	3.8	2 3	48.
Keokuk, Ia.	0.8	1.1	2.1	4.2	8.7	4.3	7.0	6.8	5.0	3.8	2 9	1.2	42.
Lamar.......	1.1	1.6	2.4	4.4	3.8	4.0	6.0	4.6	3.7	3.6	2.9	1.5	39.
Leav'wth Ks	.9	1.5	2.3	4.6	4 5	5.0	6.3	4.5	4.0	3.9	2.7	1.4	41.
St. Louis....	1.3	1.6	2.5	5.5	4.7	5.0	7.5	8.0	5.9	4.9	3 9	1.4	52.
Springfield..	1.1	1.7	2.4	5.0	4.8	4.0	5.0	3.4	3.4	3.5	8.1	1.4	38.

MISCELLANEOUS DATA FROM MORRISON OBSERVATORY, GLASGOW.

PROF. C. W. PRITCHETT.

Mean Pressure (Reduced to Freezing Point and Sea Level).

Year.	January...	February...	March.....	April.....	May.......	June.....	July.......	August....	September..	October....	November..	December..	Annual.....
1888....	30.302	30.065	30 079	30 085	29.866	29 878	29.981	29 991	30.049	29.991	30.138	30.127	30.048
1889......	30 076	30.190	30 030	30 003	29 909	29 958	29 931	30 038	30 006	30 112	30 123	30.056	30.086
1890......	30.184	30.086	30 091	30.074	29.866	29 920	29 934	30 018	30 070	29.972	30 120	30.108	30 088

Mean Relative Humidity (Per Cent).

1888.......	.	......	....	...	81.3	76.8	79.9	77 8	73.4	72.4	78.8	81 8	77.8
1889.....	84 8	77.0	74 6	67 4	68 8	76.0	75 4	70 8	76.2	76 2	73.8	76.0	74.8
1890......	79.8	79 8	.75 5	76 0	76.2	76 1	73.5	74.3	79.7	74 7	76.8	73.7	76.3

Mean Cloudiness (Per Cent) Day and Night.

1888	49	50	57	63	47	47.0	25	48	23	36	49.0	43	44.5
1889	43	46.	44	42	45	36.0	37	24	48	40	44.0	59	42
1890	57	66	55.0	56.0	48	31 0	22	35	47	42	31.0	41	44

Mean Actual Sunshine (Per Cent).

1888	60	58	51	67	59	63	80	73	86	78	58	64	66
1889	60	51	54	52	59	72	67	70	53	56	51 0	48	57
1890	40	58	43	40	53	68 0	82	68	65	52	66 0	60	56

NOTE.—Some might suppose that the per cent. of sunshine and cloudiness should be complementary or supplementary; but they are very different ratios—one the ratio of the whole number of hours of sunshine, divided by the whole number of possible sunshine, including 4 minutes for excess from refraction at rising and setting. The other ratio is that of the whole number of hours of cloudiness day and night (above 5) divided by the whole number of hours in the month.

RAINFALL STATISTICS.

Cherrapunji, Assam, India, with a mean annual rainfall of 493 inches, is the wettest place on the globe. During August, 1841, the monthly rainfall there was 264 inches, or 22 feet of water, which is the largest amount ever recorded at any place for a single month. On five successive days during this month the average rainfall was 30 inches, or 2.5 feet of water per day. For the year 1861, the annual rainfall reached the enormous amount of 905 inches, or 75.4 feet of water. Since 1871 the rainfall has been measured by a government official, and the greatest fall for a single year was 552 inches. On June 14, 1876, 40.6 inches fell in 24 hours.

The mean annual rainfall of the United States varies from less than two inches to more than one hundred inches—the dryest place being the Mohave desert in Southern California and Arizona, and the wettest place being the coast of Oregon and Washington. The mean annual rainfall at stations in the Mohave desert is 1.92 inches at Indio, California; 1.88 at Mammoth Tank, California; 1.85 at Camp Mohave, Arizona, which is probably the smallest annual rainfall of any station on the globe. At Indio the amount of rainfall for 1884-1885 was only 0 10 of an inch, which is the smallest amount recorded at any station for a whole year.

The mean annual rainfall at Neah bay, Wash., is 105.2 inches, which is the largest in the United States. For the seasonal year of 1865-1866 the rainfall was 140.9 inches at this station. This is the highest ever recorded in the United States.

The greatest monthly rainfall ever recorded in the United States was 41.63 inches January, 1888, at Upper Mattole, California, of which 25 inches fell in three consecutive days. The greatest amount in 24 hours was at Alexandria, La., June 15, 16, 1886, when 21.4 inches fell.

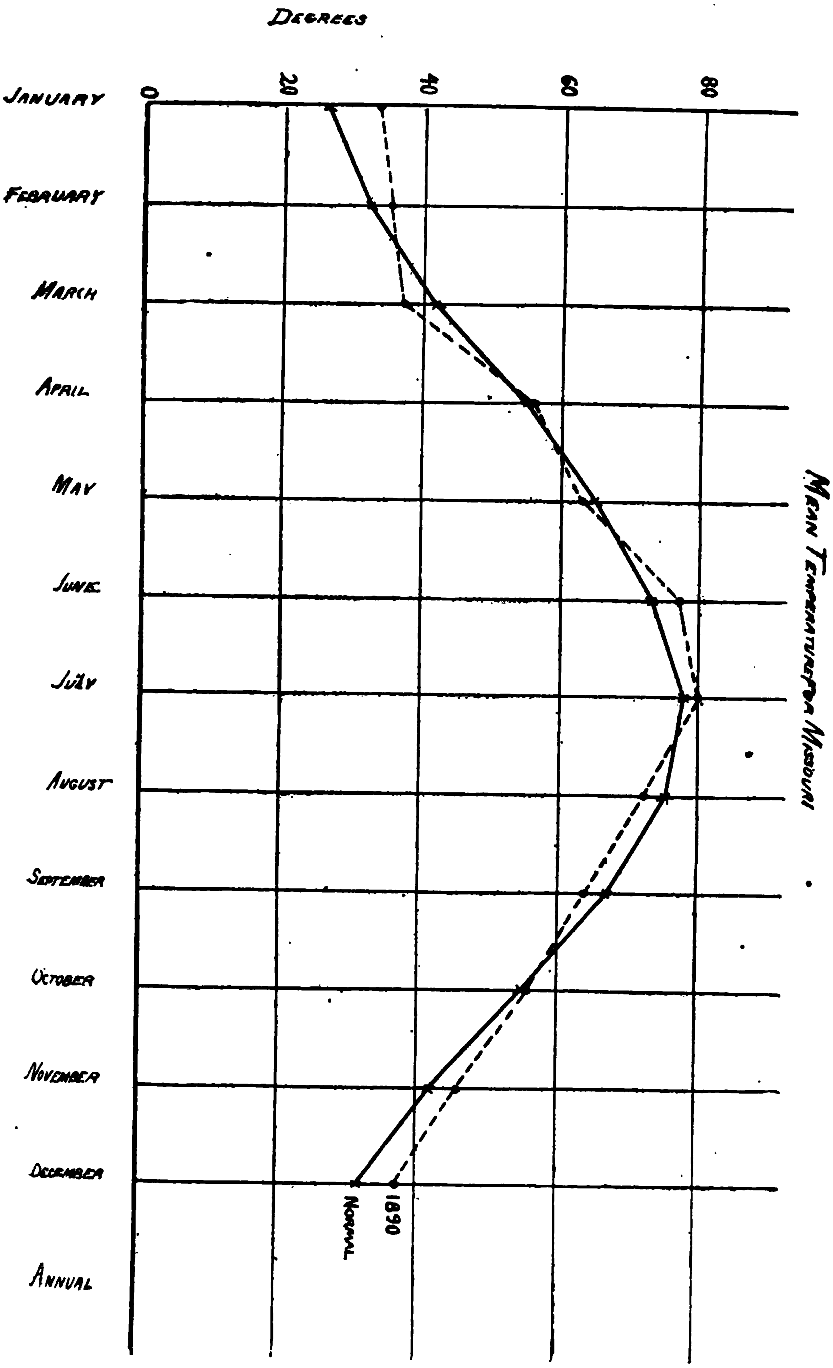
The most remarkable rainfall in Missouri was 5.05 inches in one hour at St. Louis, August 15, 1848.

MEAN MONTHLY AND ANNUAL TEMPERATURE FOR 1890.

Station.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Adrian	...	...	...	...	...	76.1	77.5	72.5	60.2	50.8	42.1	32.8	...
Appleton City	34.0	37.5	39.9	56.4	62.4	77 2	...	...	64.4	55.6	47 2	36.5	...
Austin	...	...	...	...	...	79.4	81 7	75.1	65.4	57.4	46.9	37 8	...
Bethany	24.0	...	...	52.1	63.1	79.8	77.4	73.3	62.4	54.2	39.8	34.8	...
Bradleyville	...	...	...	...	...	79.4	85.4	78.9	67.0	59 7	44.0	42.0	...
Brunswick	30.6	33.4	36.7	55.7	62.5	76.9	79.0	72.0	63.4	55.7	45.0	36.3	53.9
Cairo, Ill.	44.6	44.0	42.9	59.2	66.0	79.4	79.0	75.0	66.5	58.0	51.0	40.0	58.8
Cape Girardeau	...	...	...	...	...	...	...	...	62.8	62.0	...	...	...
Carrollton	30.0	34.0	33.0	55.0	60.0	75.2	78.0	71.3	61.1	52 5	43.4	34.7	52.4
Carthage	39.1	38 3	42.9	58.7	63.4	75.2	79.8	...	...	56 4	47 3	39 5	...
Cassville	...	...	...	...	62 4	73.8	76.7	73.4	64.6	54.0	48.3	38.6	...
Columbia (1)	36.2	37.6	37.0	56.8	63.3	77.2	79.0	72.3	63 5	56.1	47.2	37.4	55.3
Columbia (2)	...	...	...	...	...	...	...	...	...	54.7	47.0	...	...
Conception	22.3	28.4	32.2	53.9	62.3	76.4	79.0	71.2	60.1	53.1	41.5	34.1	51.2
Concordia	...	...	...	...	...	...	92.0	83.1	73.6	68.0	55.0	44.6	...
Craig	24.0	28.3	25.1	...	61.6	75.6	...	...	...	...	...	...	...
Dadeville	...	...	...	...	...	...	...	77.0	67.5	60.5	47.0	42.1	...
Darksville	...	...	...	...	...	...	76.6	74.2	61.0	...	...	...	...
Dunnegan	...	...	...	...	60.8	74.9	...	...	...	...	...	...	...
Eldon	...	...	...	...	...	...	81.6	76.6	65.6	58.1	48.6	37.6	...
Excelsior Springs	27.4	31.0	33.7	45.8	60.2	74.8	76.8	71.0	60.9	52 9	40.2	31 4	51.3
Fayette	33.4	36 1	36.4	56 0	62.8	77.1	79.5	73.6	63 8	55.3	44.8	35.0	54.5
Fortescue	27.2	30.7	34.6	56 6	61.5	72.4	79.3	72.4	63.7	53.4	42 2	35.2	52.4
Fox Creek	38.3	36 4	36.4	54.9	64.9	76.0	83.0	71.8	62.9	53.7	45.0	34.6	54.8
Frankford	39 2	31.7	32 4	48.5	...	...	...	...	...	...	...	...	...
Glasgow	32.3	34.5	36.0	55.6	62.3	76.4	79.2	70.7	63.3	55.2	45 0	36.0	53.9
Glenwood	...	...	...	...	...	76 7	79.1	69.8	65.0	...	39.6	...	...
Gordonville	...	...	...	...	...	...	...	...	...	57.0	50.0	38.4	...
Grand Pass	31.1	34.2	36.6	56.2	62.8	76.3	78.4	71.9	63.5	55.6	44.5	31 8	53.6
Harris	25.8	30.8	...	...	...	...	...	...	...	...	...	...	...
Harrisonville	31.0	31.0	33.0	54.6	61.2	74.7	77.0	72.8	63.3	54.6	43.5	34.9	52.6
Ironton	42.9	42.0	42.5	58.0	65 1	77.7	78.1	73.1	64.9	58.1	...	...	...
Jefferson Barracks	39.5	42.1	39.4	57.1	63.8	77.9	83.8	73.6	65.0	54 2	48.7	48.2	57.8
Jefferson City	...	...	...	...	...	...	...	...	...	58 3	47.8	38.6	...
Kansas City (1)	30 2	34.0	38.3	57.0	63.6	77.0	80.5	73 7	63.2	56.2	46.4	37.4	54.8
Kansas City (2)	29.4	34 2	38.2	56.9	62.2	77.9	81.1	74 4	64.7	56 3	45.5	36.9	54.8
Keokuk, Iowa	29.4	32.8	32.6	54.7	60.0	76.2	78.0	71.2	62.7	54.1	44.1	33 8	52.5
Kidder (1)	...	...	...	...	...	81.2	80 7	72.5	66.0	60.5	55.0	50.9	...
Kidder (2)	29.1	29.8	29.5	55.9	61.1	75.2	77.6	70.8	57.4	49.8	...	...	...
Kirksville	...	...	...	...	63 6	75.2	80 0	73.5	62.8	56.8	...	...	...
Lamar	33.7	...	...	52.7	63.1	77.5	81.1	72.2	...	56 7	44.8	36 5	...
Lamonte (1)	25.7	28.5	25.3	46.0	52.8	71.0	76.7	66.7	56.7	45.3	34.0	25.7	...
Lamonte (2)	28.1	32 3	37.5	56.6	63 0	77.0	80.6	74.2	64.0	55 8	45 4	37.0	54.3
Leavenworth, Kans.	39 0	40.1	43.2	57.0	65.6	79.0	80.5	75.9	65.1	58.0	50.8	43.1	58.1
Lebanon	29.0	32.9	36.4	56.1	73.8	83.7	81.5	...	63.4	54.6	43.2	33 0	...
Liberty	...	...	...	...	...	...	...	...	...	...	44 0	33.2	...
Marshall (1)	...	...	...	...	...	...	...	...	62.9	54.1	43.8	...	...
Marshall (2)	...	...	...	...	...	...	...	...	...	...	...	...	...
Marshfield	42.5	...	...	57.7	...	80.0	...	...	64.0	59.3	49.4	...	...
Mexico	...	...	...	...	...	...	...	...	...	...	...	...	...
Mine LaMotte	...	...	...	...	...	...	...	...	...	...	...	...	...
Miami (1)	29.6	34.1	35.9	56.9	46.8	79 9	80.8	73.7	64.2	55.6	40.6	34.7	54.2
Miami (2)	32.0	36.0	33.0	56.5	63.5	82.0	77.5	77.0	64 2	56.0	49 0	39.5	55.5
Nevada	...	...	...	...	...	...	81 7	75.4	64.8	...	...	...	...
New Frankfort	31.7	34.5	...	...	62 4	76.0	78.7	72.2	62.6	55.5	...	...	...
New Haven	37.7	37.8	37.7	57.2	63.8	80.0	80.9	74.9	65.1	55.6	44.8	34.6	55.8

MEAN MONTHLY AND ANNUAL TEMPERATURE—Continued.

Station.	January	February....	March......	April........	May	June........	July	August.....	September..	October	November..	December..	Annual.....
Oak Ridge................	43.1	41.9	41.0	57.9	67.8	76.5	76.0	73.9	66.4	57.0	50.2	38.9	57.6
Oregon....................	23.6	29.3	34.3	56.5	60.9	76.0	79.6	72.3	63.1	54.4	43.6	35.6	51.6
Ozark......................	....	....	41.8	60.2	....	..	...	....	....	....	....	....	....
Pickering..................	....	....	....	....	....	71.7	74.4	61.5	53.0	49.9	35.8	27.8	....
Platte River..............	27.0	31.1	36.9	56.4	62.1	76.8	80.9	74.4	63.9	55.5	43.9	35.5	53.7
Princeton.......	27.8	31.2	34.2	55.8	62.2	75.3	79.1	73.1	64.3	56.8	43.5	35.7	53.2
Protem (1)	45.6	44.3	46.4	62.4	67.0	80.1	81.4	78.3	68.5	59.9	51.2	41.7	60.6
....	....	....	..	...	....	....	....	...	....	...	....	...	..
St. Charles (2)............	33.6	39.0	38.1	56.3	57.4	74.9	80.0	73.0	66.5	53.8	47.4	37.1	54.8
St. Louis (1)..............	39.2	40.2	39.0	57.2	63.8	79.4	79.8	74.7	65.0	57.3	48.6	37.6	56.8
St. Louis (2)...............	..	....	....	....	....	....	...	....	...	54.9	46.2	34.6	....
....	....	....	....	....	....	....	....	....	....	....	....	...	....
Sarcoxie.......	....	....	....	....	62.8	75.1	77.0	73.3	63.8	55.8	48.6	39.5	....
Sedalia.....................	32.7	35.5	38.3	56.4	64.0	80.8	80.0	73.1	63.8	56.2	46.3	37.3	55.4
Springfield................	39.4	40.2	42.6	58.2	64.6	75.6	78.2	73.6	63.4	56.3	48.2	40.0	56.7
Steelville..................	39.8	39.7	39.2	56.5	....	....	....	71.3	62.2	51.1	45.4	35.3	....
Troy.......................	31.7	33.1	32.3	....	....	..	....	...	....	....	....	...	....
Warrensburg..............	30.7	33.0	36.2	54.5	61.0	76.3	79.9	72.2	63.9	55.3	49.9	43.3	54.6
Warrenton.................	34.2	33.6	35.4	56.4	64.8	79.6	82.1	..	62.6	50.6	45.0	33.0	...
Willow Springs...........	42.6	...	43.5	59.6	68.4	76.9	78.2	72.9	64.2	57.1	50.3	37.1	....
Windsor....................	36.2	34.7	36.4	50.1	63.7	76.7	79.2	72.9	64.7	53.3	46.8	34.3	54.1
Number of stations.....	47	45	45	44	46	53	55	54	59	63	58	52	31
Means	33.3	35.0	37.0	55.8	62.8	77.0	79.0	71.9	63.6	55.6	45.9	36.9	54.8


Degrees
0
20
40
60
80
January
February
March
April
May
June
July
August
September
October
November
December
Annual
Mean Temperature for Missouri
Normal
1890

MAXIMUM AND MINIMUM TEMPERATURES, 1890.

Station.	Jan.		Feb		March.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		Year.	
	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..	Max..	Min..
Adrian	....	....	....	....	....	....	....	....	....	....	98	50	102	44	102	44	90	27	85	18	74	14	64	3	102	....
Appleton City	73	1	72	—1	74	5	85	27	90	33	100	54	....	....	102	53	88	36	83	27	76	25	62	13	....	—1
Austin	....	....	....	....	....	....	....	....	....	....	97	60	100	68	101	58	88	40	88	32	79	26	53	13	101	....
Bethany	50	—11	54	—5	55	—13	71	27	86	36	94	60	98	62	97	55	85	35	80	24	63	22	56	7	98	—13
Bradleyville	....	....	....	....	....	....	....	....	....	....	96	62	98	70	96	66	88	42	86	28	88	18	80	8	....	....
Brunswick	66	3	70	—4	70	3	88	29	90	35	97	53	102	56	95	53	87	34	85	25	73	20	64	12	102	—4
Cairo, Ill.	73	17	75	18	74	11	80	36	88	42	96	62	95	59	91	56	87	45	84	32	72	31	63	20	96	11
Cape Girardeau	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	89	49	83	40	....	....	....	....	....	....
Carrollton	60	—6	65	—3	58	2	76	30	80	37	95	60	99	56	94	52	87	38	70	26	75	27	61	10	99	—6
Carthage	73	5	75	—1	75	9	84	35	84	41	96	54	99	66	....	....	....	....	85	31	77	29	62	3	99	—1
Cassville	....	....	....	....	....	....	....	....	86	36	95	50	97	53	96	50	88	35	82	23	76	23	65	—3	97	....
Centreville	82	7	85	5	82	—8	93	27	96	31	107	45	106	41	104	42	99	35	96	16	83	16	83	—2	107	—8
Columbia (1)	70	0	75	—1	70	—6	88	29	90	33	100	48	104	54	99	47	90	34	88	22	80	23	65	7	104	—6
Columbia (2)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	85	23	78	23	....	....	....	....
Conception	50	—19	68	—8	71	—3	87	25	86	31	95	52	100	56	96	49	88	36	80	22	68	20	64	6	100	—19
Concordia	....	....	....	....	....	....	....	....	....	....	....	....	107	78	102	72	90	60	86	54	74	42	62	28	107	....
Craig	56	—15	60	—5	70	—10	....	....	90	38	99	60	....	....	....	....	....	....	....	....	....	....	....	....	....	—15
Dadeville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	98	64	88	45	84	35	78	31	63	20	....	....
Darksville	....	....	....	....	....	....	....	....	....	....	....	....	99	54	99	54	82	32	....	....	....	....	....	....	....	....
Dunnegan	....	....	....	....	....	....	....	....	78	38	88	51	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Eldon	....	....	....	....	....	....	....	....	96	40	106	58	108	58	100	54	90	38	90	28	80	28	66	18	108	....
Excelsior Springs	65	—6	71	—3	71	—4	89	27	90	33	100	45	103	58	101	53	88	32	81	20	72	20	64	6	102	—6
Fayette	68	—1	71	0	69	—2	85	29	90	32	100	51	104	50	98	52	96	32	86	22	80	22	64	2	104	—2
Fortescue	58	—15	67	—9	66	—4	88	26	89	35	95	54	102	58	96	54	89	41	72	24	72	22	70	2	102	—15
Fox Creek	66	4	72	2	66	0	82	26	84	34	92	56	92	56	94	50	92	40	84	24	74	28	64	14	94	0
Frankford	....	—1	....	—2	....	—4	80	29	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Glasgow	70	—3	71	—1	68	—3	86	28	88	34	97	52	103	55	97	54	89	36	85	25	79	22	63	9	103	—3
Glenwood	....	....	....	....	....	....	....	....	....	....	97	44	108	54	101	41	89	32	....	....	74	24	....	....	108	....
Gordonville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	84	26	74	26	68	12	....	....
Grand Pass	68	—3	70	0	70	0	88	30	90	34	96	55	102	55	95	52	90	37	84	28	76	24	60	9	102	—3
Hannibal	52	0	70	—2	44	0	92	28	88	31	98	54	....	....	....	....	91	38	90	26	74	20	60	14	....	—2
Harris	54	—11	58	—4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

Harrisonville	60	1	72	—1	71	4	86	30	92	41	96	58	99	66	96	58	96	88	80	26	70	22	61	12	99	—1
Hermann	66	0	68	—4	....	—8	....	....	....	....	101	....	....	....	95	57	90	43	85	27	70	28	53	12	....	—8
Ironton	76	10	80	6	74	4	88	32	86	44	95	62	94	62	92	56	88	45	87	24	....	....	....	..	95	4
Jefferson Barracks	75	7	79	4	70	1	90	26	91	31	100	52	101	50	99	47	92	38	89	24	78	25	65	8	101	1
Jefferson City	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	85	30	77	28	63	13	....	....
Kansas City (1)	68	—5	71	0	73	5	89	30	87	36	97	55	102	59	97	56	87	39	82	30	75	24	68	14	102	—5
Kansas City (2)	67	—6	72	—1	74	4	91	29	91	36	100	50	104	57	100	53	90	36	88	26	78	24	67	13	104	—6
Keokuk, Iowa	64	—5	67	—1	67	—6	84	27	90	35	98	53	104	54	98	49	92	36	86	22	77	26	57	13	104	—6
Kidder (1)	....	—12	....	—6	....	....	....	....	....	....	....	....	106	59	96	54	90	38	...	24	73	20	....	....	106	—12
Kidder (2)	....	....	....	..	....	....	....	...	....	....	91	67	98	68	87	63	81	55	73	51	70	44	66	35	98	....
Lamar	....	....	....	....	....	....	....	....	87	32	100	50	101	54	98	56	88	31	89	27	....	....	....	....	....	....
LaMonte (1)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	90	34	80	28	....	....	....	....
LaMonte (2)	54	—5	60	—7	40	—4	65	27	68	36	102	65	103	65	76	53	68	33	60	22	45	22	45	10	103	—7
Leavenworth, Kas	67	—6	70	—3	76	0	90	29	88	36	97	51	192	58	98	55	88	37	79	29	74	24	70	12	102	—6
Lebanon	75	5	78	2	72	8	82	34	80	40	94	60	94	64	92	62	86	38	80	28	76	30	70	24	94	2
Liberty	62	—6	70	—2	72	1	92	27	94	33	103	49	105	54	....	....	90	32	82	24	74	21	64	9	105	—6
McCune Station	....	....	....	....	....	....	....	...	....	....	....	...	93	71	90	70	85	76	...	....	68	....	56	....	....	....
Marshall (1)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	...	....	....	...	....	78	23	64	6	....	....
Marshall (2)	....	....	....	....	....	....	....	....	....	...	....	....	....	....	....	....	90	38	83	26	76	26	....	....	....	....
Marshfield	71	10	....	....	....	....	88	30	...	....	97	58	....	....	....	....	89	45	88	38	76	33	....	....	....	....
Mexico	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mine LaMotte	73	12	74	9	71	5	85	32	84	35	92	53	92	55	90	52	87	41	81	23	71	24	67	2	92	2
Miami (1)	68	—6	70	—2	74	—4	....	....	....	...	....	....	102	62	96	56	90	34	....	....	....	....	....	....	102	—6
Miami (2)	72	—8	74	—2	68	—2	85	28	95	32	106	58	105	50	100	54	90	34	86	26	74	24	63	14	106	—8
Nevada	....	....	....	....	...	....	....	....	....	....	....	....	...	....	105	60	91	40	....	....	....	....	....	....	....	....
New Frankfort	62	—3	68	0	...	...	....	....	86	38	97	58	101	62	92	57	91	35	83	28	...	....	....	....	101	—3
New Haven	70	7	78	2	72	4	88	30	90	37	101	62	103	66	102	57	95	43	90	26	86	26	64	14	103	2
Oak Ridge	76	14	75	16	77	9	83	35	95	38	103	60	102	57	99	52	96	45	84	30	76	30	65	18	102	9
Oregon	65	—16	67	—7	74	—2	92	27	85	33	96	50	103	56	96	52	92	35	78	27	73	21	70	6	103	—16
Ozark	....	....	....	....	78	0	86	30	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pickering	....	....	...	..	....	....	...	....	74	26	92	50	110	46	84	48	74	30	70	24	61	14	54	—1	110	....
Platte River	58	—12	68	—4	74	—4	86	26	86	32	96	46	104	56	96	52	88	32	80	24	68	20	60	8	104	—12
Princeton	60	—10	60	—4	72	—11	90	27	91	32	103	51	106	59	106	51	90	34	85	24	70	23	65	8	106	—11
Protem (1)	81	11	81	5	82	9	93	38	96	42	106	57	106	62	104	58	98	46	91	30	80	26	76	2	106	2
Protem (2)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
St. Charles (2)	61	5	76	2	70	4	86	28	86	30	99	51	99	50	97	48	90	37	88	24	79	26	60	12	99	2
St. Louis (1)	74	8	78	4	69	6	89	30	90	37	98	57	98	57	97	54	92	41	89	29	76	32	63	17	98	4
St. Louis (2)	....	....	....	....	...	....	...	....	....	....	....	....	....	...	...	....	....	....	88	24	77	23	62	4	....	....
St. Louis (3)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....
Sarcoxie	....	.	....	....	....	...	...	....	85	33	95	50	98	54	95	53	89	39	84	27	76	26	65	—2	98	....
Sedalia	72	—3	70	—4	73	—2	86	27	90	35	99	53	102	57	100	52	89	37	86	26	78	24	60	11	102	—4
Springfield	74	4	76	—2	75	6	88	32	88	36	96	54	95	59	94	56	89	38	84	29	78	29	64	11	96	—2

MAXIMUM AND MINIMUM TEMPERATURES—Continued.

Station.	Jan.		Feb.		March.		April.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.		Year.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min..	Max.	Min.	Max.	Min.
Steelville	72	8	78	3	74	—2	88	32	....	...	...	...	94	52	94	49	82	40	86	20	72	20	64	—2	94	—2
Troy	....		....	....	...	...	....	...	....	....	....	....	....	....	....	....	....	...	...	....	....	...	...	..	...	....
Warrensburg	66	—3	71	—2	70	3	86	30	84	39	98	56	105	65	98	55	88	40	84	26	74	26	62	19	105	—3
Warrenton	61	5	....	5	...	0	...	37	85	46	99	59	103	65	...	....	...	40	70	26	65	29	58	16	103	0
Willow Springs	75	13	....	...	79	4	92	33	97	34	105	50	95	56	94	53	90	42	24	28	75	26	61	8	...	....
Windsor	60	8	62	6	58	9	70	28	80	48	90	60	95	60	99	53	88	37	88	26	71	21	63	10	99	6
Withers' Mill	66	2	70	0	68	0	86	32	88	34	98	60	103	62	99	58	94	38	86	64	98	26	60	16	103	0
State	81	—19	81	—9	82	—13	93	25	96	30	106	44	110	41	105	41	98	27	91	16	86	14	76	—3	110	—19

NORMAL MEAN MONTHLY AND MEAN ANNUAL TEMPERATURES FOR MISSOURI.

Stations.	County.	No. of years record	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Allenton	St. Louis	6	29.0	35.5	41.6	53.8	62.5	71.0	75.1	72.4	64.4	51.0	42.6	30.6	52.3
Boonville	Cooper	6	25.0	29.8	41.3	54.3	64.0	73.1	76.9	76.1	66.1	56.5	39.5	28.9	52.6
Cairo, Ill.	Mississippi	19	34.9	39.9	46.9	58.7	67.6	75.0	79.4	77.3	69.3	59.0	46 3	38.7	57.8
Chamois	Osage	13	28.7	34.5	42.9	54.4	65.5	74.1	78.9	76.2	68.5	57.5	43.4	34.8	55.0
Corning	Holt	6	21.9	27.7	39.4	52.8	66.6	74.2	77.1	75.8	65.6	54.8	38 5	23.6	51.6
Glasgow	Howard	5	22.7	27.9	39 4	55.2	63.4	74.2	78.0	73.8	65.6	55.4	42.5	34.9	52.8
Harrisonville	Cass	12	25.3	32.3	38.5	54.0	63 7	73.1	78.1	73.8	67.0	53.9	41.9	31.2	52.7
Ironton	Iron	12	30.0	35.2	43.0	55.8	64.3	71.3	75.3	73.7	65.9	54.6	41.8	33.7	53 7
Kansas City	Jackson	6	26.3	33.7	42.4	54.4	65.8	75.3	79.9	76.5	67.1	55.1	42.8	32.1	54.3
Keokuk, Ia.	Clarke	19	23.3	29.1	37.5	51.9	62.9	72.1	77.4	74.6	65 8	54.1	39.2	29 4	51.4
Kirksville	Adair	7	19.7	25.7	36.7	51.9	61.6	70.9	76.5	71.5	63.5	50.6	39.7	28 9	49.8
Leavenworth	Plattee	19	24.6	31.2	40.7	54 0	64.6	73.5	78.2	75.8	67.0	55.5	40.6	31.2	53.1
Lexington	Lafayetta	6	20.8	27.3	39.4	51.7	62.0	70.4	75.3	74.3	65.9	55.5	41.1	26.6	50.9
Miami	Saline	7	21.6	28.7	40.2	55.4	65.9	73.3	78.0	74.5	67.3	54.7	41.3	32 0	52.7
Oregon	Holt	35	22.1	28.7	38.3	51.9	63.5	72.5	74.9	75 0	66.4	54.0	39.2	27.8	51 2
Protem	Taney	9	32.9	39 9	48.4	62.0	67.9	77.3	81.4	77.8	71.2	60.1	47.3	39.4	58.8
Rolla	Phelps	6	30.4	35.9	43.9	53 6	63.9	71.6	76.7	73.6	64.4	51.1	40.6	31.6	53.1
St. Louis	City	55	31.4	35.0	43.3	56.0	65.8	74.3	79.0	76.4	68.7	55.9	43.2	34.0	55.2
St. Louis	City	44	31.8	35.3	44.0	56.2	66 4	74.7	77.2	77.1	69.1	56.0	42.7	33 3	55.3
Sedalia	Pettis	11	22.5	31.5	42.2	56.0	65.7	75.1	79.2	76.0	69.1	56.0	43.2	34 3	54.3
Springfield	Greene	8	30.8	36.3	44.1	57.2	63.7	73.3	77.0	74.3	66.5	57.1	43.6	35.8	55 0
Warrenton	Warren	5	29.9	31.1	41.9	57.1	64.6	72 9	77.8	76 2	66.9	53.2	42.2	34.2	54.0
Wyaconda	Lewis	5	21.9	29.5	36.3	48.8	63.8	71 4	76.9	73.0	67.2	49.8	38.6	26.6	50.3
			26.4	32.3	41.4	54.7	64.6	73.2	77.6	75.1	66.9	54.8	41.8	31.9	53.4

HIGHEST AND LOWEST MONTHLY

Observations made at sunrise by Mr. John E. Erwin

Year.	January.				February.				March.				April.				May.				June.			
	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date
1868...	30	19	−3	17	44	15	−1	10	68	24	15	3	60	29	25	5	71	5	48	13	82	19	54	22
1869...	45	29	15	10	55	13	−1	22	53	28	1	15	60	22	27	4	72	26	43	19	74	20	44	15
1870...	47	12	−1	17	55	28	−5	20	49	26	1	15	64	23	24	17	70	5	44	11	77	30	49	11
1871...	53	12	−4	18	53	23	−1	13	63	8	26	3	68	8	34	1	71	31	38	6	76	20	51	30
1872...	37	11	−8	29	40	23	1	13	49	30	12	21	68	27	30	22	68	9	40	2	75	13	56	10
1873...	45	15	−23	29	48	18	0	1	67	15	4	3	72	5	31	12	70	30	43	4	79	21	56	1
1874...	39	3	−2	15	46	12	4	24	58	3	18	13	54	13	26	1	74	24	45	24	78	28	52	12
1875...	41	27	−17	9	41	22	−8	7	60	14	10	2	60	8	23	17	75	8	30	3	76	16	50	7
1876...	60	1	8	29	60	9	1	4	60	6	8	21	66	12	30	1	70	18	39	3	76	23	49	5
1877...	44	30	−4	8	41	22	24	20	51	31	8	9	62	23	32	30	70	31	31	1	76	29	50	10
1878...	40	18	8	7	52	20	12	11	56	27	30	18	65	18	34	1	70	1	36	15	74	28	48	10
1879...	50	27	−30	4	42	10	2	14	63	28	11	19	58	25	18	2	74	26	39	6	74	14	44	2
1880...	56	9	14	31	57	17	8	4	58	26	12	14	....	....	..	....	..	..		...		....		....
Period	60	1876	−30	1879	60	1876	−8	1875	68	1868	1	1870	72	1873	18	1879	75	1875	30	1875	82	1868	44	1879

TEMPERATURES AT FAYETTE, MO.

and furnished by Prof. T. Berry Smith.

July.				August.				September.				October.				November.				December.				Annual	
Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Date	Lowest	Date	Highest	Lowest
90	18	66	26	75	11	56	31	72	8	42	17	64	2	28	8	65	8	22	17	48	19	— 6	9	90	— 6
76	3	56	22	78	26	58	8	70	24	40	26	62	1	17	26	54	3	22	20	52	10	— 1	20	78	— 1
78	1	54	8	75	2	59	30	70	8	52	25	70	27	36	18	68	8	19	22	50	4	—18	24	78	—18
80	16	54	20	79	8	45	31	67	10	36	29	68	9	36	7	57	7	1	24	34	16	— 8	4	80	— 8
88	31	58	4	87	1	58	30	78	7	38	27	66	3	30	26	50	1	— 1	9	30	1	—20	24	88	—20
79	14	58	19	79	31	54	4	76	1	41	30	64	17	19	25	48	7	14	19	60	2	12	4	79	—28
88	22	59	1	86	11	56	2	72	8	44	29	69	27	28	15	63	7	14	25	54	18	9	29	88	— 2
80	17	64	21	73	28	56	22	80	9	36	26	70	29	24	31	56	1	7	29	58	23	— 2	17	80	—17
79	20	59	24	75	15	54	26	75	6	40	30	65	30	27	16	66	1	18	30	42	13	— 8	30	79	— 6
80	7	60	20	76	11	56	24	76	1	48	18	70	1	40	5	54	14	10	30	59	25	16	1	80	— 4
78	14	60	2	77	19	58	12	70	9	36	13	75	17	20	31	52	5	19	28	37	7	—12	28	78	—12
80	23	56	30	75	4	48	18	66	28	35	25	70	1	24	30	56	15	14	20	50	5	—12	25	80	—30
90	1868	54	1870	87	1872	45	1871	80	1875	35	1879	75	1878	17	1869	68	1870	— 1	1872	60	1873	—20	1872	90	—30

MEAN TEMPERATURE.

ALLENTON, ST. LOUIS COUNTY.

Year.	January....	February....	March.....	April.......	May.........	June.........	July.........	August.......	September...	October.....	November...	December...	Annual......
1864.......	(26.4	35.2	38.2)	49.6	64.4	73.9	76.1	73.4	66 6	46.3	42.2	28 2	(51.7)
1865.......	25.5	34.7	43.1	53.2	62 8	71.9	70.8	....	.....	.....	.....	.....	......
1866.......	(28.4	30.2)	39.3	56.4	58.4	67.4	64.5	67.5	58.5	51.6	42.5	30.8	(50 5)
1867.......	21.8	37.7	32.8	54.2	58.4	71.4	74.0	74 5	67.7	55.0	44.2	35.7	52.3
1868.......	24 2	32.6	49.6	50.4	63.8	70.5	80.2	70.6	61.6	53.2	42.1	27.8	52.2
1869.......	35.8	35.6	38.4	53 4	61.9	67.4	73.3	75.9	64.6	44.4	39.3	32.6	51.9
1870.......	32.2	34 6	39.5	55.0	65.5	70.5	76.2	72.3	67.6	55.8	45.2	28.8	53.6
1871.......	34.2	37.8	48.7	58.6	64.9	75.1	75 6	.....	.....	....	....	.....	. ...
Sums...	173.7	213.0	291 4	430.8	500.1	568.1	600.7	434.2	386.6	306.3	255.5	183.9	210.0
Means..	29.0	35.5	41.6	53.8	62.5	71.0	75.1	72.4	64.4	51.0	42.6	30.6	52.5

BOONVILLE, COOPER COUNTY.

1878.........	....	.....	.....	... .	....	73.4	80.8	79.0	67.8	53.7	44.4	22 7	......
1879.........	22.2	31.4	46 3	56.1	70.1	73.8	78.2	79.1	65.8	60.3	43.1	27.1	......
1880.	41.2	35.8	41.7	57.7	69.4	72.2	77.2	77.4	65.4	51.3	28.2	22.7	......
1881	17.1	24.8	35.3	50.8	68.6	77.2	80.6	83.5	71 3	59.0	39.3	40.9	......
1882.........	35.0	38.9	43.6	54.0	56.1	70.2	72.1	72.6	64.8	.....	41 0	30.3	.....
1883.........	22.0	29 7	39 3	55.2	58.5	.....	74.3	70.4	61.5	58.2	40.8	29.9	......
1884.........	17.6	28.7	41.5	52.0	61.2	.....	74.8	70.4	.....	.....	39.6	.....	......
1885.	20.0	19.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	......
Sums.....	175.1	208.8	247.7	325.8	383.9	365.8	538.0	532.4	396 6	282.5	276.4	173.6	......
Means....	25.0	29.8	41.3	54.3	64.0	73.1	76.9	76.1	66.1	56.5	39.5	28 9	. ....

CAIRO, ILLINOIS.

1871..	....	.....	....	.....	.....	......	. ..	79.3	79.5	67.2	60.4	34.3	.....
1872..	31.2	37.0	42.5	62.0	68.3	75.5	80.3	79.9	70.6	57.7	40.3	29.0	56.2
1873..	30.3	37.9	48.0	55.4	66.8	77.5	78.8	78.6	68.8	53.7	44.9	40.7	56 8
1874..	39.6	40.0	48.1	52.0	70.2	75.9	79.3	78.9	72.1	59 0	45.8	40.5	58.4
1875..	28.3	32 9	44.8	54.8	65.8	74.2	78.8	73.6	68.0	55 3	45.9	45.5	55.7
1876 .	44.3	43.8	43.1	58.8	68.9	73.9	79.6	77.5	68.5	56.2	43.7	27.3	57,1
1877..	33.8	43.3	43.6	57.5	65.4	75.0	78.7	77.5	70.0	61 3	45.9	50.1	58,5
1878..	39.5	44.4	57.6	64.1	67 8	73.8	82 5	81.0	68.9	58.7	49.9	32.9	60,1
1879..	34.8	38.7	52.1	58.9	71.7	75.1	82.5	75.8	66.8	65 2	52.1	41.1	59,6
1880..	51.3	45.0	49.4	61.9	72.7	76.3	78.7	78.4	67.1	57·7	37.2	32.6	59,0
1881..	29.3	37.6	45.4	55.7	72.2	77.5	82.3	82.8	75.1	65.1	47.5	45.1	59,6
1882..	38.5	49.9	51.9	60.5	63.8	76.2	75.8	75.1	68.9	64.7	48.9	37.6	59,2
1883..	32.3	38.8	43 8	59.9	65.2	75.9	77.7	74 8	68.0	60.2	50.0	42.1	57.4
1884..	27.9	42.0	47.6	56 2	66.4	73.7	78.2	75.4	74 2	63.3	48.5	36.2	57.4
1885..	29.8	31.9	42.5	59 7	65.6	74.5	80.0	76.5	69.3	55.9	48.7	39.9	56.1
1886..	25 4	35.1	44.7	58 0	68.7	71.9	78.1	76 8	70 8	59.5	45 3	30.7	55.4
1887..	33.4	43.1	47.9	60.1	70.1	75.1	80.5	78.0	71.1	56.1	46 6	36 3	58.2
1888..	31.7	37.5	44.9	61.4	64.6	72.9	80.0	76.0	67.4	55 8	46.7	39.4	55.5
1889..	38 0	35.6	50.0	59.6	65.8	70.8	77.4	75 1	67.0	56.6	44 2	54.1	57.8
1890..	44.6	44.6	42.9	59.2	66.0	79 4	79.0	75.0	66.5	58.0	51.0	40 0	58.8
Sums	664.0	758.2	890.8	1115 7	1285.1	1425.1	1587.5	1546 2	1386.3	1180.4	926 5	774.5	1097.8
Me'ns	34.9	39.9	46.9	58.7	67.6	75.0	79.4	77.3	69.3	59.0	46.3	38.7	57.8

CHAMOIS, OSAGE COUNTY.

G. W. Dallas.

Year.	January ...	February ...	March	April	May	June	July	August	September ..	October	November ..	December ..	Annual .....
1873......	23.1	32.2	43.0	51.2	71.0	79.2	79.2	76.3	66.2	50.2	42.3	36.0	54.2
1874......	34.2	33.2	43.0	45.1	72.2	81.2	83.2	77.1	69.2	60.1	44.2	37.1	56.6
1875......	21.2	26.1	41.2	52.1	66.2	75.2	80.0	74.3	66.2	56.1	41.2	45.1	53.7
1876....	41.1	41.1	38.2	56.2	60.0	71.1	78.1	77.3	66.1	53.0	39.2	22.2	53.6
1877......	27.0	38.0	37.0	52.2	60.2	74.0	80.1	73.0	69.0	60.0	41.1	47.0	54.9
1878......	34.1	38.2	51.2	59.1	60.2	70.3	79.0	78.2	70.1	56.1	46.2	24.3	55.6
1879......	27.1	33.2	47.2	55.0	68.0	74.3	82.1	73.2	65.1	59.2	47.6	33.2	55.4
1880......	45.2	41.1	41.4	55.6	68.1	72.3	77.8	78.3	64.2	57.0	32.2	26.0	55.1
1881......	21.7	30.2	38.5	52.2	66.2	78.5	81.2	84.3	77.1	63.4	45.3	42.7	56.8
1882......	35.0	45.2	50.0	59.3	61.2	71.2	72.1	75.1	70.1	64.2	49.0	33.1	57.1
1883......	24.3	31.1	40.3	56.2	62.2	71.2	76.4	73.0	65.6	54.9	47.1	37.4	53.3
1884......	23.8	33.2	44.4	53.7	64.6	73.0	78.2	73.8	73.1	60.9	44.5	30.2	54.4
1885......	22.3	25.7	40.6	56.9	68.2	74.3	80.2	74.2	66.5	52.7	44.8	36.7	53.6
1886......	22.2	33.9	44.1	56.6	68.1	71.3	77.4	78.6	71.0	.....	.....	.....	......
Sums...	402.3	482.4	600.1	761.4	916.4	1037.1	1105.0	1066.7	959.5	747.8	564.7	458.0	714.3
Means..	28.7	34.5	42.9	54.4	65.5	74.1	78.9	76.2	68.5	57.5	43.4	34.8	54.9

CONCEPTION, NODAWAY COUNTY.

Rev. M. Eckstein, Rev. Fr. Paul.

1888.........	13.5	26.1	32.6	53.8	56.8	69.6	77.5	70.5	63.3	50.9	37.6	32.1	48.7
1889.........	25.0	. .	43.0	53.2	61.8	69.3	79.4	72.3	66.1	51.5	37.6	42.5	......
1890.........	22.3	28.4	32.2	53.9	62.3	76.4	79.0	71.2	60.1	53.1	41.5	34.1	51.2
Sums	60.8	54.5	107.8	160.9	180.9	215.3	235.9	214.0	189.5	155.5	116.7	108.7	99.9
Means	20.3	27.2	35.9	53.6	60.3	71.8	78.6	71.3	63.2	51.8	38.9	36.2	50.0

CORNING, HOLT COUNTY.

Horace Martin, Wm. Kaucher.

1870.........	....	....	....	54.4	....	....	....	71.4	67.6	54.5	42.6	26.9	......
1871.........	25.4	32.2	43.3	56.3	65.0	75.1	76.7	74.3	63.7	54.0	35.5	20.8	51.9
1872.........	22.0	30.6	34.6	54.6	64.4	73.4	76.8	76.3	62.6	53.4	.....	16.8	......
1873.........	16.4	26.4	40.0	46.4	62.0	75.3	76.2	77.4	63.0	49.0	38.8	.....	......
1878.........	....	....	....	....	....	.....	79.6	78.3	66.7	.....	40.4	18.8	......
1879.........	20.2	29.9	43.5	55.2	68.0	71.7	78.7	76.5	63.2	59.2	42.3	22.1	52.5
1880.........	35.2	32.5	40.3	55.3	70.8	73.3	76.9	74.9	65.7	52.3	29.5	19.3	52.2
1881.........	14.7	20.6	32.8	.....	69.3	76.3	.....	81.1	69.7	57.7	38.5	37.6	......
1882.........	29.0	.....	47.7	47.8	.....	.....	.....	72.1	67.7	58.1	40.3	26.3	......
1883.........	12.0	21.5	36.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	......
Sums	174.9	193.7	314.9	370.0	399.5	445.1	385.3	682.3	589.9	438.2	307.9	188.6	156.6
Means.....	21.9	27.7	39.4	52.8	66.6	74.2	77.1	75.8	65.6	54.8	38.5	23.6	52.2

EAST PRAIRIE (near Charleston), MISSISSIPPI COUNTY.

A. Miller.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1868	(30.3	39.1	52.6	55.8	63.1	71.0	82.4	75.4	67.6	55.9	45.4	31.8)	55.9
1869	41.6	41.9	43.2	57.0	64.1	71.4	76.3	79.5	66.3	47.9	41.6	36.7	55.6
1870	38.4	39.6	43.8	57.2	67.3	73.5	78.3	75.6	69.6	58.2	41.6	34.2	56.4
Sums	80.0	81.5	87.0	114.2	131.4	144.9	154.6	155.1	135.9	106.1	83.2	70.9	167 9
Means	40.0	40.8	43.5	57.1	65.7	72.4	77.3	77.6	68.0	53.0	41.6	35.4	56.0

EXCELSIOR SPRINGS, CLAY COUNTY.

A. Reinisch.

1888	.....	.....	.....	.....	...	.....	.....	....	61.3	51.5	36.0	32.1	......
1889	25.6	24.3	40.8	52 2	65.0	70.5	76.0	71.2	61.6	50.9	35.7	43.2	51.4
1890	27.4	31.0	33.7	45.8	60.2	74.8	76.8	71.0	60.9	52.9	40.2	31.4	51.3
Sums	53.0	55.3	74.5	98.0	125.2	145.3	152.8	.....	122.5	155.3	111.9	106.7	102.7
Means	26.5	27.6	37.2	49.0	62.6	72.6	72.4	71.1	61.2	51.8	37.3	35.9	51.4

FOX CREEK, ST. LOUIS COUNTY.

Wm. Muir.

1887	....	...	.....	.....	.....	.....	.....	.....	68.2	53.5	43.2	30.7	...
1888	23.7	31.6	42.1	57.8	62.4	72.9	78.0	72.6	63.5	55.1	41.9	36.8	53.2
1889	33.7	30.5	45.8	57.8	62.0	69.7	76.7	72.5	63.8	52.5	38.8	47.6	54.3
1890	38.3	36.4	36.4	54.9	64.9	76.0	83.0	71.8	62.9	53.7	45.0	34.6	54.8
Sums	95.7	98.5	124.3	170.5	189.3	218.6	237.7	216.9	258.4	214.8	168.9	149.7	162.3
Means	31.9	32.8	41.4	56.8	63.1	72.9	79.2	72.3	64.6	53.7	42.2	37.4	54.1

GLASGOW, HOWARD COUNTY.

T. Berry Smith, C. W. Pritchett.

1878	.....	.....	....	.....	.....	74.6	.....	.....	.....	56.4	.....	.....	......
1883	.....	.....	.....	59.0	66.0	76.5	82.5	79.5	69.5	57.3	46.6	36.6	.....
1884	19.5	31.4	44.4	54.9	66.8	77.2	.....	71.2	70.2	58.5	42.7	26.0	......
1885	18.1	19.1	36.5	50.1	59.9	.....	74.8	.....	62.7	.....	41.4	30.2	......
1886	17.2	29.4	40.0	54.2	65.0	.....	.....	.....	.....	.....	.....	.....	......
1888	18.8	30.9	38.0	57.3	61.3	71.9	78.1	73.0	64.8	52.7	40.8	34.5	51.8
1889	30.2	27.9	41.2	55.1	62.2	68.8	75.2	73.0	63.8	52.1	38.4	46.1	52.8
1890	32.3	34.6	36.1	55.6	62.3	76.4	79.2	72.2	62.7	55.2	45.0	36.0	53.9
Sums	136.1	173.3	236.2	386.2	443.5	370.8	389.8	368.9	393.7	332.2	254.9	209.4	.....
Means	22.7	28.9	39.4	55.2	63.4	74.2	78.0	73.8	65.6	55.4	42.5	34.9	52.8

GRAND PASS, SALINE COUNTY.

E. R. Graham.

Year.	January.....	February.....	March	April.....	May.....	June	July	August.....	September..	October.....	November ..	December...	Annual.....
1888.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	52.5	42.9	35.0	.....
1889.........	29.4	27.3	43.6	54.9	63.1	69.4	75.4	72.1	63.5	52.7	38.6	45.7	53.0
1890.........	31.1	34.2	36.6	56.2	62.8	76.3	78.4	71.9	63.5	55.6	44.5	31.8	53.6
Sums......	60.5	61.5	80.2	111.1	125.9	145.7	153.8	144.0	.....	160.8	126.0	112.5	......
Means.....	30.2	30.8	40.1	55.6	63.0	72.8	76.9	72.0	63.5	53.6	42.0	37.5	53.3

GREENFIELD, DADE COUNTY.

S. B. Bowles.

Year.	January.....	February.....	March	April.....	May.....	June	July	August.....	September..	October.....	November ..	December...	Annual.....
1883.........	.....	.....	.....	55.0	63.0	75.0	75.0	77.0	67.0	60.0	46.0	.....	......
1884.........	18.0	33.5	44.0	53.8	67.0	71.0	79.0	74.0	72.0	61.0	47.0	29.0	......
1885.........	26.3	27.0	44.0	57.0	63.0	75.0	80.2	75.0	67.0	52.0	47.0	38.0	......
1886.........	21.0	34.0	43.0	57.0	72.0	73.0	79.0	78.0	71.0	59.0	43.0	.....	......
Sums......	65.3	94.5	131.0	222.8	265.0	294.0	313.2	304.0	277.0	232.0	183.0	67.0	......
Means.....	21.8	31.5	43.7	55.7	66.2	73.5	78.3	76.0	69.2	58.0	45.8	33.5	......

HARRISONVILLE, CASS COUNTY.

J. Christian, Geo. M. Houston, A. J. Sharp.

Year.	January.....	February.....	March	April.....	May.....	June	July	August.....	September..	October.....	November ..	December...	Annual.....
1863........	.....	.....	...	.....	.....	70.6	76.2	76.6	70.8	51.0	41.7	29.6	.....
1864........	24.4	33.6	41.2	52 4	67.8	76.1	80.3	74.1	72.7	51.6	38.2	26.1	(53.2)
1865........	25.2	33.5	40.5	52.0	65.0	72.4	73.6	74.9	73.0	56.8	45.6	24.3	53.1
1866........	29.4	31.2	39.9	57.9	60.9	69.6	77.3	72.9	60.4	56.6	44.4	29.4	52.5
1867........	23.0	34.4	28.5	51.5	57.8	73 1	73.8	74.7	67.2	56.2	44.8	38.8	51.6
1868........	20.6	32.8	37.6	47.9	65.1	73.3	81.7	70.3	61.5	53.0	40.0	25.6	(50.8)
1869........	33.6	33.2	37.3	51.8	61.9	68.4	74.5	76.3	63.7	45.8	38.3	30.2	51.2
1870	29.7	36.3	38.4	56.8	67.0	74.0	79.3	73.0	67.5	53.0	41.9	28.6	(53.8)
1883........	.....	.... .	39.7	59.3	64.0	73.4	81.4	75.5	66.7	55.6	45.3	35.4	......
1884........	19.2	29.7	43.6	54.4	66.7	77.8	83.7	76.1	75.5	64.3	47.3	29.8	55.7
1885........	19.8	.....	40.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	......
1887........	.....	.....	.. .	.....	.....	.....	.....	.....	65.7	50.7	40.9	26.8	......
1888.	19.8	32.0	37.5	55.3	61.9	76.4	82.0	70.4	63.2	53.6	38.4	34.9	52.1
1889........	28.8	27.1	42.9	54.3	63.6	70.5	75.0	71.2	66.8	51.9	36.8	46.0	53.0
1890........	31.0	31.0	33.0	54.6	61.2	74.7	77.0	72.8	63.3	54.6	43 5	34.9	52.6
Sums	304.5	354.8	500.1	648 2	763.9	950.3	1015.8	958.8	938.0	754.7	587.1	436.4	579.6
Means. ..	25.3	32.3	38.5	54.0	63.7	73.1	78.1	73.8	67.0	53.9	41.9	31.2	52.7

HEMATITE, JEFFERSON COUNTY.

J. M. Smith.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1868	(37.2	38.3	41.2)	53.0	65.7	73.4	82.6	72.7	63.4	57.0	45.5	31.4	(55.1)
1869	39.1	38.5	40.3	55.6	64.7	71.2	77.1	79.4	66.0	47.6	40.9	34.9	54.6
1870	35.4	38.0	42.0	57.2	68.8	74.5	78.8	67.4	70.8	56.9	46.3	30.8	56.4
1871	38.4	41.9	41.4	61.6	68.3	78.4	75.8	78.0	65.8	57.6	39.4	31.4	56.5
1872	29.6	32.8	40.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sums	142.5	151.2	163.9	227.4	267.5	297.5	315.3	306.5	266.0	219.1	172.1	128.5	167.5
Means	35.6	37.8	41.0	56.8	66.9	74.4	78.8	76.6	66.5	54.8	43.0	32.1	55.8

HERMITAGE, HICKORY COUNTY.

Miss Isabella and Dr. W. Moore.

1867	.....	.....	.....	.....	.....	.....	.....	.....	70.0	55.6	44.1	37.7	.....
1868	22.7	32.7	(46.6)	50.9	65.2	74.0	82.3	71.8	64.5	55.2	41.4	26.2	(52.8)
1869	33.9	34.2	38.1	51.8	60.1	67.8	72.9	76.1	63.1	42.4	38.6	30.8	50.8
Sums	56.6	66.9	84.7	102.7	125.3	141.8	155.2	147.9	197.6	153.2	124.1	94.7	103.6
Means	28.3	33.5	42.4	51.4	62.6	70.9	77.6	74.0	65.9	51.1	41.4	31.6	51.8

Numbers in parentheses interpolated.

HOUSTONIA, PETTIS COUNTY.

S. J. Spurgeon.

1885	18.0	20.6	39.8	53.9	59.0	71.4	77.8	72.3	65.6	53.0	44.4	31.9	50.6
1886	17.1	30.8	41.4	51.5	67.2	71.4	78.1	78.5	71.0	59.6	41.1	24.8	52.8
1887	22.5	32.7	43.6	56.3	67.5	73.0	78.7	75.4	.....	.....	.....	.....	.....
Sums	57.6	84.1	124.8	161.7	193.7	215.8	234.6	226.2	136.6	112.6	85.5	56.7	103.4
Means	19.2	28.0	41.6	53.9	64.6	71.9	78.2	75.4	68.3	56.3	42.8	28.4	51.7

IRONTON, IRON COUNTY.

W. H. Delano.

Year.	January	February .	March	April......	May........	June	July.........	August	September ..	October	November...	December...	Annual .....
1878..........	.....	.....	.....	.....	.....	75.1	79.5	78.8	67.9	56.3	46.0	28.4	......
1879..........	29.8	34.0	50.7	55.5	69.4	72.4	80.5	74.0	65.0	64.0	50.0	35.7	56.8
1880..........	47.0	40.0	43.2	58.8	69.7	72.5	74.6	75.4	64.2	53.6	31.5	28.5	54.9
1881..........	23.4	32.8	41.0	50.1	70.4	75.4	78.8	78.3	74.0	62.2	44.1	42.3	56.0
1882..........	35.6	45.3	50.2	59.0	60.2	74.0	72.2	71.7	71.8	60.7	43.4	34.0	56.5
1883..........	27.3	35.6	39.1	57.8	63.0	70.3	74.0	71.0	64.0	57.2	46.4	37.0	53.6
1884..........	23.4	39.0	44.4	.....	.	71.8	76.3	71.4	72.1	59.5	44.6	31.6	......
1885..........	24.8	27.4	40.9	57.5	63.5	70.8	74.0	70.6	63.8	40.3	42.8	25.1	50.1
1886..........	20 3	29.7	38.3	52.0	62.6	65.6	71.6	86 0	64 3	50.6	36.5	23.4	50.1
1887..........	24.4	33.9	39.5	51.4	61.9	66.1	72.1	68.4	62.2	45.6	36.3	27.1	49.1
1888..........	22.0	28.5	37 9	53.6	56.0	65.1	70.4	65.8	56.4	47.0	37.3	38.6	48.2
1889..........	39.5	33.6	48.1	60.0	65.0	70.4	76.8	73.0	66.4	54.5	42.8	52.2	56.8
1890..........	42.9	42.0	42.5	58.0	65.1	77.7	78.1	73.1	64.9	58.1	......	.... .	......
Sums.	360.4	421.8	515.8	613.7	706.8	927.2	978.9	957.5	857.2	709.6	501.7	403.9	532.1
Means	30.0	35.2	43.0	55.8	64.3	71.3	75.3	73.7	65.9	54.6	41.8	33.7	53.7

JEFFERSON CITY.

N. DeWyl, J. C. Halligan.

1868.........	(23.7)	33.8	49.2	50.0	65.6	74.5	84.6	74.0	(61.4)	54.0	42.4	28.4	(53.4)
1869.........	35.8	35.0	36.2	52.7	63.6	70.8	76.8	79.4	(65.0)	45.8	39.6	32.3	(52.8)
1870.........	31.0	36.2	38 6	57.4	70.3	75.1	81.0	75.8	(69.8)	58.4	46.4	30 2	(55.8)
1871.........	32.4	37 0	46.6	54.1	66.7	76.7	80.6	.....	......	.....	.....	27.7	......
1872.........	26.2	28.8	34.7	.....	58.1	77.8	.....	.....	......	.....	.....	.....	......
1890.........	.....	.....	.....	.....	.....	.....	.....	.....	......	.....	58.3	47.8	38.6
Sums......	125.4	170.8	205.3	214.2	324.3	374.9	343.0	229.2	....	216.5	176.2	157.2	.....
Means....	31.4	34.2	41.1	53.6	64.9	75.0	85.8	76.4	......	54.1	44.0	31.4	......

KANSAS CITY, JACKSON COUNTY.

Signal Service.

1888..........	.....	.....	.....	.....	.....	.....	80.2	74.2	67.2	54.6	42.0	35.9	......
1889..........	31.2	28.5	45.4	55.5	63.3	70.8	77.0	74.3	64.6	54.8	40.0	46.4	54.3
1890..........	30.2	34.0	38.3	57.0	63.6	77.0	80.5	73.7	63.2	56.2	46.4	37.4	54.8
Sums......	61.4	62.5	83.7	112.5	126.9	147.8	237.7	222.2	195.0	165.6	128.4	119.7	109.1
Means	30.7	31.2	41.8	56.2	63.4	73.9	79.2	74.1	65.0	55.2	42.8	39.9	54.6

S. W. Salisbury, J. P. Kenmuir, S. J. Spurgeon.

Year.	January...	February...	March ...	April........	May.........	June.........	July.........	August	September ..	October......	November...	December...	Annual......
1870.........	(31.9)	38.5	41.0	57.1	66.5	72.4	78.8	74.2	67.7	55.4	45.0	29.3	(54.8)
1871.........	29.0	35.3	45.4	56.0	64.7	76.0	80.0	76.0	65.5	57.0	37.3	28.5	54.2
1872.........	27.1	33.0	.....	.....	.....	75.4	.....	.....	.....	.....	.....	.....	.....
1873....... .	23.2	32.2	44.6	41.8	66.4	79.3	80.6	82.8	69.6	53.4	43.8	.....	.....
1878.........	.....	.....	.....	.....	.....	76.0	.....	79.5	68.5	55.5	46.5	20.3	.....
1879.........	.....	35.7	.....	.....	69.7	.....	.....	75.0	.....	.....	.....	.....	.....
1881.........	.....	.....	.....	.....	70.6	.....	.....	.....	.....	.....	.....	.....	.....
1887.........	.....	.....	.....	.....	.....	.....	.....	.....	68.1	54.6	43.8	27.7	.....
1888.........	17.9	32.5	38.9	58.1	61.7	73.7	80.6	74.8	66.8	53.9	41.6	35.8	53.0
1889.........	31.3	28.5	46.3	56.6	64.8	71.6	78.2	75.2	65.7	54.7	39.1	46.0	54.8
1890.........	29.4	34.2	38.2	56.9	62.2	77.9	81.1	74.4	64.7	56.3	45.5	36.9	54.8
Sums	157.9	269.9	254.4	326.5	526.6	602.3	479.3	611.9	536.6	440.8	342.6	224.5	216.8
Means	26.3	33.7	42.4	54.4	65.8	75.3	79.9	76.5	67.1	55.1	42.8	32.1	54.2

KEOKUK, IOWA.

Signal Service.

1871....	.....	.....	.....	.....	.....	.....	.....	75.6	63.3	57.0	35.4	25.2	.....
1872....	24.9	31.0	34.4	54.0	64.4	75.2	78.4	77.2	68.0	54.9	33.9	19.9	51.4
1873....	17.5	25.5	38.6	47.7	61.3	77.8	76.2	78.3	64.1	49.4	37.4	32.2	50.5
1874....	27.7	29.2	38.0	44.0	66.7	75.5	80.4	76.7	67.0	55.4	39.7	31.2	52.6
1875....	16.3	18.4	33.8	48.9	61.8	71.0	75.6	70.3	63.8	50.6	35.1	36.5	48.5
1876....	33.8	34.2	34.6	52.6	63.5	69.7	76.4	75.8	64.4	51.8	36.2	18.8	51.0
1877....	22.0	38.3	32.6	50.7	62.1	71.4	76.9	74 3	69.8	55.3	38.9	42.9	52.9
1878....	34.9	38.2	50.4	57.5	60.2	70.6	81.5	77.7	67.3	54.3	44.0	23.0	55.0
1879 ...	21.6	29.8	42.6	52.2	66.8	72.1	80.7	75.0	62.9	61.6	42.7	26.9	52.9
1880....	41.3	36.3	40.0	53.8	68.8	73.9	77.7	77.5	65.4	52.2	31.5	24.1	53.5
1881....	18.8	24.9	33.7	46.8	69.8	72.7	79.0	79.2	72.4	57.0	39.6	37.6	52.6
1882....	28.1	39.5	41.7	53.7	56.8	71.1	72.4	73.4	66.1	58.6	42.3	27.7	52.6
1883....	15.5	24.9	35.3	54.0	59.8	69.7	76.0	71.2	62.7	51.5	42.8	31.8	49.6
1884....	18.7	27.5	37.3	50.6	62.3	71.5	74.9	72.0	71.1	58.5	40.6	23.0	50.7
1885....	16.2	16.5	34.7	49.7	60.6	70.1	78.5	70.0	64.6	49.4	40.6	28.7	48.3
1886....	14.6	26.3	36.5	53.6	64.1	70.7	77.5	77.1	68.2	57.6	38.5	21.2	50.5
1887....	19.1	29.5	38.9	53.6	66.5	72.8	79.1	74.1	65.9	50.0	40.5	27.3	51.4
1888....	13.6	25.7	34.2	53.2	58.0	70.3	77.1	72.1	62.8	51.4	41.8	34.0	49.5
1889....	28.2	24.6	43.0	53.9	61.8	68.3	75.2	73.2	64.0	50.8	37.6	42.7	51.9
1890....	29.4	32.8	32.6	54.7	60.0	76.2	78.0	71.2	62.7	54.1	44.2	33.8	52.5
Sums...	442.2	553.1	712.9	985.2	1195.3	1370.6	1471.5	1491.9	1316.5	1081.4	783.3	588.5	977.9
Means..	23.3	29.1	37.5	51.9	62.9	72.1	77.4	74.6	65.8	54.1	39.2	29.4	51.5

KIRKSVILLE, ADAIR COUNTY.

CHAS. PATTERSON.

Year.	January....	February...	March......	April.......	May.........	June.	July.........	August.....	September..	October....	November...	December...	Annual.....
1883..........	.....	.....	....	....	59.4	69.6	75.4	71.9	62.6	50.5	40.4	30.4	......
1884..........	18.9	25.6	37.4	50.8	60.7	70.3	73.6	69.5	68.8	56.9	40.1	21.5	49.5
1885..........	14.3	15.9	35.1	49.9	60.1	68.8	76.4	70.3	64.1	49.8	41.3	29.7	47.3
1886..........	14.4	27.9	37.8	54.0	64.5	70.8	77.9	76.5	68.0	.. ..	37.8	19.8	......
1887..........	16.9	28.3	39.1	54.1	66.4	72.9	77.9	74.0	65.6	49.4	40.6	25.8	50.9
1888..........	14.8	27.7	35.2	54.1	58.6	71.0	77.3	71.7	62.0	51.8	40.7	34.1	48.9
1889..........	28.4	24.6	42.6	53.8	61.8	68.4	75.7	67.3	59.4	46.2	37.0	40.9	50.5
1890..........	29.1	29.8	29.5	55.9	61.1	75.2	77.6	70.8	57.4	49.8	.....	.....	......
Sums.....	137.8	179.8	256.7	362.6	492.6	567.0	611.8	572.0	507.9	354.4	277.9	202.2	248.1
Means	19.7	25.7	36.7	51.9	61.6	70.9	76.5	71.5	63.5	50.6	39.7	28.9	49.6

LAMAR, BARTON COUNTY.

JAS. K. HULL, Signal Service.

1885..........	.....	.....	40.8	55.4	62.0	72.0	76.8	73.4	66.3	53.4	47.2	36.3	....
1886..........	19.3	33.4	42.6	54.8	69.7	70.7	77.3	76.5	69.9	59.2	42.7	27.9	53.7
1887..........	28.6	37.9	47.5	58.0	67.2	73.2	77.9	74.9	67.9	53.6	45.0	30.7	55.2
1888..........	25.3	36.7	41.9	58.7	62.5	71.8	79.2	74.9	66.7	55.0	43.0	38.0	54.5
1890..........	.....	.....	.....	.....	63.6	75.2	80.0	73.5	62.8	56.8	.....	....	.....
Sums......	73.2	108.0	172.8	226.9	325.0	362.9	391.2	373.2	333.6	278.0	177.9	132.9	163.4
Means	24.4	36.0	43.2	56.7	65.0	72.6	78.2	74.8	66.7	55.6	44.5	33.2	54.4

LEXINGTON, LAFAYETTE COUNTY.

J. B. ALEXANDER.

1878..........	....	.....	.....	.....	.....	70.3	75.2	79.0	69.1	55.8	45.9	21.7	......
1879..........	22.0	31.5	45.8	54.6	68.5	71.8	76.5	74.3	63.2	59.0	41.7	24.5	......
1880..........	39.3	.....	40.5	51 5	.....	71.4	.....	74.9	63.5	49.7	.....	.....	......
1881..........	16.8	22.6	33.2	47.5	66.5	73.1	76.5	79.6	70.1	57.7	39.1	.....	......
1882..........	.....	40.5	44.6	....	58.2	71.9	... .	71.6	.....	57.2	.....	28.3	.....
1883..........	15.8	24.4	36.2	55.5	59.8	68.7	73.6	70.0	61.3	50.5	41.8	32.0	......
1884..........	17.1	26.0	.....	48.6	59.5	69.2	73.9	.....	69.5	58.3	40.9	.....	......
1885..........	15.2	16.9	36.9	50.1	59.8	68.6	74.1	70.0	62.9	.. .	39.3	.....	......
1886..........	.....	... .	.....	53.8	.....	69.1	77.3	76.8	68.4	.....	39.2	.....	......
1887..........	19.5	29.3	.....	.....	.....	.....	... .	72.5	65.4	.....	.....	.....	......
Sums......	145.7	191.2	236.2	361.6	372.3	633.8	527.1	668.7	593.4	388.2	287.9	106.5	......
Means.....	20.8	27.3	39.4	51.7	62.0	70.4	75.3	74.3	65.9	55.5	41.1	26.6	......

LEAVENWORTH, KANSAS.

SIGNAL SERVICE.

Year.	January.....	February....	March.......	April.......	May	June.......	July........	August......	September...	October.....	November....	December....	Annual......
1871..	.....	.....	.....	.....	.....	77.3	77.6	72.8	70.7	56.2	36.4	24.1	.....
1872..	24.7	30.9	36.3	56.6	64.5	76.5	78.2	77.9	67.0	55.8	34.9	21.0	52.0
1873..	18.7	29.7	41.6	48.1	63.4	75.2	77.2	78.5	64.7	50.6	41.7	31.5	51.7
1874..	28.5	28.9	39.8	48.3	69.5	76.3	82.3	81.1	66.1	56.7	40.6	32.6	54.2
1875..	15.1	20.5	37.3	49.5	65.2	76.2	78.0	72.9	66.3	54.4	36.9	39.9	51.0
1876..	35.9	88.3	37.3	55.2	65.1	70.9	78.4	77.8	65.6	53.3	37.4	22.3	53.2
1877..	23.9	39.5	36.8	53.6	63.7	71.5	76.2	75.1	67.8	54.5	39.1	44 1	53.8
1878..	33.9	40.0	50.6	58.5	61.8	70.0	79.7	78.5	67.6	55.2	45.9	23.2	55.4
1879..	23.6	32.8	46.3	54.8	68.3	73.1	79.3	77.0	65.4	62.0	44.6	26.4	54.5
1880..	41.4	37.9	42.2	55 4	70.1	73.9	76.9	76.5	65.2	52.4	31.7	25.6	54.1
1881..	20.5	25.1	36.5	50.1	69.8	76.8	80.2	81.7	70.1	58.4	40.2	40.2	54.1
1882..	32.4	42.0	45.8	56.1	58.7	73.5	72.5	73.2	68.8	58.9	43.3	31.6	54.7
1883..	19.4	27.9	39.4	56.3	60.8	71.1	76.8	72.7	63.4	53.0	44.0	35.1	51.7
1884..	21.1	27.9	41.3	50.8	62.0	72.1	77 3	71.8	71.7	59.4	43.1	24.1	51.9
1885..	19.0	21.6	40.1	52.7	61.8	72.2	77.9	73.5	66.1	52.3	43.5	32.8	51.5
1886..	14.4	30.2	39.2	54.4	68.1	71.2	78 4	78.8	70.5	59.7	40.0	23.7	52.4
1887..	20.7	28.9	42.7	57.3	67.9	73.3	79.2	73.3	66.7	52.6	42.8	27.2	52.7
1888..	16.3	31.4	37.0	56.5	60.5	72.2	80.0	74.2	67.0	54.5	40.7	35.8	52.2
1889..	29.8	27.5	45.2	55.4	63.8	70.6	76.8	74.0	64.7	54.2	39.2	45.3	53.9
1890..	28.1	32.3	37.5	56.6	63.0	77.0	80.6	74.2	64.0	55.8	45.4	37.0	54.3
Sums	467.4	593.3	772.9	1026.2	1228.0	1470.9	1563.5	1515.5	1339.4	1109.9	811.4	624.5	1009.3
Me'ns	24.6	31.2	40.7	54.0	64.6	73.5	78.2	75.8	67.0	55.5	40.6	31 2	53.1

LOUISIANA, PIKE COUNTY.

J. D. DAWSON, M. J. HASSLER.

1883.........	.....	.....	39.6	55.1	60.5	70.9	77.9	71.6	66.3	58.8	49.5	36.0	......
1884.........	20.8	29.0	39.8	52.0	61.9	67 9	73.8	69.3	69.2	57.4	40.8	24.6	......
1885.........	16.9	17.9	35.7	51.0	65.0	69.0	76.6	.	.....	.....	.....	.....	.....
1886.........	.....	29.7	41.0	54.0	61.0	72.1	75.4	77.5	67.5	52.6	41.5	24.6	......
1887.........	23.2	32.2	49.5	56.5	67.5	72.1	80.1	73.1	67.3	50.6	41.9	29.8	......
1888.........	20.6	30.8	39.2	55.6	59.6	72.0	.....	.....	.....	.....	....	.....	......
Sums.....	81.5	139.6	244.8	324.2	375.5	424.0	383.8	291.5	270.3	219.4	173.7	115.0	......
Means.....	20.4	27.8	40.8	54.0	62.6	70.7	76.8	72.9	67.6	54.8	43.4	28.8	......

MIAMI, SALINE COUNTY.

Dr. A. H. W. Sullivan.

Year.	January ...	February ...	March	April.........	May	June.........	July	August.........	September..	October......	November..	December...	Annual.....
1879..........	.....	.....	.....	.....	72.5	73.0	77.5	73.0	.....	.....	.....	.....	.....
1883..........	.....	.....	.....	56.9	63.0	73.0	77.0	73.0	.....	52.0	43.2	34.1	.....
1884....	18.0	28.7	42.6	52.7	.....	74.0	76.0	72.5	72.2	60.0	42.0	24.9	.....
1885..........	18.0	19.0	39.0	54.0	62.0	71.0	78.0	72.0	65.0	51.0	43.0	31.0	50.2
1886..........	15.0	29.0	40.0	55.0	67.0	69.0	77.0	78.0	71.0	60.0	40.0	23.1	52.0
1887..........	22.0	32.0	41.0	56.0	68.0	76.0	79.0	75.7	68.9	50.9	42.2	27.4	53.1
1888..........	18.1	30.9	38.0	56.8	61.1	73.5	79.5	76.2	64.8	56.1	41.0	35.3	52.6
1889..........	30.7	27.4	44.6	55.1	68.8	70.5	77.3	76.2	65.9	53.1	38.4	45.7	54.9
1890..........	29.6	34.1	35.9	56.9	64.8	79.9	80.8	73.7	64.2	55 6	40.6	34.7	54.2
Sums	151.4	201.1	281.1	443.4	527.2	659.9	702.1	670.3	471.1	382.6	289.4	256.2	264.4
Means........	21.6	28.7	40.2	55.4	65.9	73 3	78.0	74.5	67.3	54.7	41.3	32.0	52.9

NEOSHO, NEWTON COUNTY.

J. M. Sherwood.

1878..........	.....	... .	.....	.....	.....	.....	78.6	78.2	68.7	57.2	49.2	27.5	......
1879..........	30.3	36.0	52.6	58.5	69.2	74.0	80.8	75.8	69 8	.. .	49.0	34.7	......
1880..........	46.4	40.3	46.7	63.9	73.0	74.6	78.2	77.0	69.8	55.1	30.9	32.8	......
1881..........	23.9	31.7	43.9	59.2	72.7	79.3	81.3	81.5	75.2	70.0	.....	....	......
Sums	100.6	108.0	143.2	181.6	214.9	227.9	318 9	312.5	283.5	182.3	129.1	95.0	......
Means........	33.5	36.0	47.7	60.5	71.6	76.0	79.7	78.1	70.9	60.8	43.0	31.7	......

OZARK, CHRISTIAN COUNTY.

J. J. Brown.

1887..........	.....	.....	.....	.....	. ...	.....	.....	.....	.....	.....	.....	32.1	......
1888..........	31.5	39.6	46.0	64.0	66.3	75 7	.....	77.9	68.2	54.0	45.0	37.8	......
1889..........	34.4	32.5	45.7	57.1	64.3	76.7	79.0	73.4	66.2	55.6	41.4	51.6	......
1890..........	.....	.....	41.8	60.2	.....	.....	....	... .	.....	.....	.....	.....	......
Sums......	65.9	72.1	133.5	181.3	130.6	152.4	.....	151.3	134.4	109.6	86.4	121.5	......
Means ...	33.0	36.0	44.5	60.4	65.3	76.2	79.0	75.6	67.2	54.8	43.2	40.5	......

OREGON, HOLT COUNTY.

WM. KAUCHER.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1855	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40.5	30.5	.....
1856	7.8	19 5	30 4	53 9	60 9	72 8	77.0	69.3	61.7	56.6	34 8	19.4	46 9
1857	7 7	28 9	31 1	37.7	55 5	71.1	77.1	74 2	68.4	50.0	33.0	35.7	47 5
1858	35.7	28.7	44 8	49 2	60.1	75.0	75.9	79 5	69 9	55.2	34.2	36.7	52.7
1859	30.4	30.8	43 8	48.6	65.5	71.8	77 8	74.1	66.1	58.5	44.0	19 7	52 1
1860	30.1	35.7	49.8	55.1	69.1	76 8	81.7	77.9	69 8	57.6	39.1	25 0	55 5
1861	20 5	30 0	38 6	53 2	59 7	74 8	75 6	74 5	65.7	58 8	40.2	29 9	51.3
1862	15.7	18.9	33.2	45 9	63.8	71.6	76 9	75.1	67 5	53 9	37 2	37.3	49.5
1863	33.0	26.9	39.6	56.6	65 0	69 4	74.6	74 9	70 4	45 1	38.2	26 4	51 7
1864	20.8	33.8	35.7	46 4	64.7	75.6	79.2	78.0	70.6	48.2	38 4	23 9	51 3
1865	24.9	33.8	36 2	49.4	65.7	72 7	73.1	74.8	73.7	56.7	47 1	22 2	52 5
1866	25.6	28 1	34 8	54.6	61.2	69 6	78.5	74 1	61 5	56.7	45.0	29.0	51.6
1867	20 9	32.1	35 1	51.2	58 3	74.7	76.6	77.5	68.8	56.8	46.2	34.3	51 [illegible]
1868	17.4	31.3	48 5	47.7	66.7	78 0	84 5	72 9	61.5	55.1	39 1	24 0	51 5
1869	31.0	31 2	36.2	49.6	61.4	69.4	74 8	77.7	65.0	45.8	36 5	29 9	50.7
1870	26.7	34.2	34 2	56.4	67.7	78.4	80.3	71.8	67.9	56.1	45.2	28.8	53.5
1871	26 6	32 8	44.1	56.6	65 0	75.6	76 2	74.3	64.2	55 9	35.4	21.9	52 4
1872	21.5	30.1	34.0	54 5	63 5	74.5	75.5	75.7	64.8	55.5	32.4	18.4	50 [illegible]
1873	17.1	27.8	40.7	47.6	62.8	75 0	76.4	78.7	64.3	50.7	41.0	23.1	50 9
1864	24.7	25.1	36.4	46.0	68.2	74.4	80.6	80.0	65 8	56 0	37.8	29 6	52 [illegible]
1875	12.2	16 5	33.9	48 0	64.8	74.6	75 6	71.9	65.1	52 0	34.5	37.3	49.1
1876	31.9	34.7	31.8	53 7	63.6	69.8	76.7	76 5	64 4	52 6	35.8	19.8	50.9
1877	21 0	37 1	35.0	51.4	62.2	69.8	75.2	74.1	68 2	52.8	37 0	41.7	52 [illegible]
1878	30.8	38.2	49.3	57 6	60 2	69.0	77 8	77 6	66 7	53.9	44 9	20 4	53 9
1879	20 2	29 8	43 8	54.6	67.7	71.1	77.1	74.9	64.2	61.3	41.4	21.9	52.4
1880	33.0	34 8	39.9	54.8	69.5	72 3	73.2	75 6	64 8	51.8	28 8	21.2	52.3
1881	15.6	21.2	33.0	48.4	68.8	75 7	79.2	81 9	70 0	56.9	37.3	36.8	52.4
1882	28.1	38 8	43 5	54 5	57 1	71.9	71.5	72.7	68.9	58.5	41 3	27.3	53.9
1883	14 6	23.1	36.9	55.6	59 5	70 0	74.9	71.2	62.4	50 1	41 6	31 7	49 4
1884	17.9	23.8	37.8	49.3	61 4	70 6	75 8	70.1	71.3	58.9	41.1	20.3	49 9
1885	14.2	17.2	37.2	51.8	63 5	70 3	77 3	72.8	65 8	51.5	41.6	31 3	49.5
1886	10 7	28.1	36.6	58.9	68 8	71 8	78.6	78 4	69.4	60 7	39 3	21 3	51 4
1887	17 2	25.6	40 2	56 4	67.8	78.4	78.8	73.6	66.0	51.9	41.7	25.7	51 7
1888	12.8	28 9	34 5	55 7	59.3	71.1	78.8	72.6	65 1	53.1	39 9	33 9	50 4
1889	26 9	25.4	43 8	54 8	63.1	69 9	74.9	73 3	63.7	52.5	37.2	42 9	52 5
1890	23.6	29.3	34.3	56.5	60 9	76.0	79 6	73.3	63 0	54 4	43.6	35 5	52 5
Sums	773 8	1006.7	1338 9	1817 2	2222 0	2537.5	2619 8	2624.5	2325 6	1891 6	1411.3	1001.7	1799 6
Means	22.1	28.7	38 3	51 9	63.5	72.5	74 9	75.0	66.4	54 0	39.2	27.8	51.4

PRINCETON, MERCER COUNTY.

Wm. Hirons.

Year.	January.....	February ...	March.......	April	May........	June	July.........	August......	September...	October......	November...	December....	Annual......
1887..........	.....	.....	.....	.....	.....	.....	.....	.....	... .	.....	.....	39.4	26.4
1888.	13.3	28.8	35.8	57.4	61.6	74.6	83.8	76.1	64.0	52.0	39.7	33.8	51.7
1889..........	27.9	26.7	45 3	55.1	66.2	76.6	81.4	78.7	65 9	54.0	39.8	44.6	55.2
1890..........	27.8	31.2	34.2	55.8	62.2	75.3	79.1	73.1	64.3	56.8	43.5	35.7	53.2
Sums......	69.0	86.7	115.3	168.3	190.0	226 5	244 3	227.9	194.2	162.8	162.4	140.5	160.1
Means	23.0	28.9	38.4	56.1	63.3	75.5	81.4	76.0	64 7	54.3	40.6	35.1	53.4

PROTEM, TANEY COUNTY.

S. C. Turnbo.

1881..........	.....	.....	.....	.....	.....	.....	.....	.....	76.1	75.6	45.3	44.2	......
1882..........	37.4	49.7	55.3	63.2	63.0	76.1	75.3	75.5	69.0	63.3	48.2	37.0	59.4
1883..........	30.3	37.1	45.6	61.4	66.3	76.4	79.6	76.7	67.5	61.3	50.0	40.3	57.7
1884..........	25.8	38.3	48.7	56.7	67.8	76.4	81.6	76.2	76.4	63.2	47.4	29.1	57.3
1885..........	28.8	32.2	45.5	62.2	67.1	80.2	82.6	78.3	70.0	56 0	49.8	39.0	57.7
1886..........	24.2	36.2	46.4	60.0	74.3	77 3	81.7	81.0	74.3	58.3	45.2	32.5	56.6
1887..........	34.3	43.3	51 4	64.0	70.7	76.9	82.7	78 3	72.8	57.1	46.6	35.0	59 4
1888..........	31.9	41.1	46.2	65.3	66.9	77.1	84.2	79.2	68.9	56.9	45.2	39.6	58.3
1889..........	38.1	36.7	50.1	63.1	67.9	74.9	82.5	77.1	68.2	59 2	44.1	55.3	59.8
1890..........	45.6	44.3	46.4	62.4	67.0	80.1	82.4	78.3	68.5	59.9	57.2	41.7	60.6
Sums......	296.4	358.9	435.6	558.3	611.0	695.4	732.6	700.6	711.7	600.8	473.0	393.7	526.8
Means......	32.9	39 9	48.4	62.0	67.9	77.3	81.4	77.8	71.2	60.1	47.3	39.4	58.5

ROLLA, PHELPS COUNTY.

H. Ruggles.

1867..........	.....	.....	.....	.....	(59.0	72.1	74.7	74.4	67.8	55.7)	44.4	39.0	......
1868..........	25.8	34.0	50.7	50.5	63.8	69.9	78.9	72.0	63.4	54.5	42.5	29.0	52.9
1869..........	36.7	37.9	40.8	53.0	60.8	67.6	74.7	77.0	64.2	44.7	40.0	34.6	52 7
1870..........	34.1	36.0	40.4	53 0	67.1	72.8	82.8	74.6	72.4	56.1	45.2	30.1	55.4
1871..........	34.2	39.9	50.1	57.9	63.9	74.3	75.3	72.8	58.0	53.6	37 4	29.2	53.9
1872...	26.7	32.9	39.9	56 8	64.2	72.0	74.8	73.6	65.3	50.2	35.8	23.4	51.3
1873..........	25.2	34.7	41.6	50.7	63.5	72.8	73.8	71.3	63.2	47.3	39.2	35.8	51.6
Sums......	182.7	215.4	263.5	321,9	383.3	429.4	460.3	441.3	386.5	306.4	284.5	221.1	317.8
Means	30.4	35 9	43.9	53.6	63.9	71.6	76.7	73.6	64 4	51.1	40.6	31.6	53.0

TABLE SHOWING MAXIMUM, MINIMUM, AND MEAN MONTHLY TEM-

[Temperature in

Year	January.			February.			March.			April.			May.			June.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
1837..	54	5	29.6	61*	19*	38 7	68*	18*	41.7	87*	25*	49.6	86*	38*	63.4	88*	58*	72.1
1838 .	65	7	34.7	49	— 5	20 8	-85	26	50.5	93	30	53 5	86	38	60.5	94	43	75 7
1839..	71	13	37·2	67	8	38 5	78	5	45 0	84	40	63.1	90	40	66 8	98	43	70 4
1840..	49	— 6	26.3	81	10	39.8	67	22	47 2	86	33	61.1	88	46	67.3	93	56	75 9
1841..	60	—11	28.6	65	1	32 9	76	26	46 1	82	38	54.9	93	45	66 7	97	52	77.6
1842..	66	16	39 7	67	2	37 4	86	28	56.7	88	43	63.0	88	42	66.8	95	45	72 7
1843..	72	0	36.7	60	— 1	25 4	55	8	27 5	93	25	55 3	91	42	66.8	97	46	73 9
1844..	59	11	32.9	66	15	41.2	80	26	46 5	87	38	66.7	92	44	67.7	94	58	75 6
1845..	65*	23*	40.6	73*	16*	44 1	79*	20*	45 4	91*	24*	64 3	86*	44*	64.7	96*	56*	74.7
1846..	61*	21*	38.7	52*	2*	31.1	75*	20*	47.2	84*	31*	59 0	89*	50*	69 3	92*	55*	[illegible]
1847..	66*	0*	27.2	66*	2*	36.2	76*	12*	41.4	84*	30*	59.3	87*	41*	63 5	88*	54*	73 0
1848..	64*	— 4*	39 4	73*	12*	40.4	78*	0*	44.5	82*	35*	55 2	91*	44*	69.0	90*	55*	72.5
1849..	64*	1*	29.0	60*	— 2*	31 2	78*	26*	49.2	84*	29*	54.4	88*	39*	64.8	94*	59*	73.4
1850..	62	12	37 2	74	— 1	37.2	75	28	43 8	79	23	49.7	90	38	63 4	96	54	76.8
1851..	64	1	35.4	70	14	38 5	78	23	48 5	76	34	54.4	92	29	69 6	92	54	73 4
1852..	65	—12	28 1	66	14	39 0	82	19	48.0	81	29	53.0	91	42	67.4	94	47	71.6
1853..	64	9	34-8	69	4	34.1	81	21	43 4	82	37	56.8	91	41	64 0	97	54	73.3
1854..	60	— 3	28 2	70	16	39.5	80	26	47.6	88	26	57 2	90	45	68.1	97	49	76.7
1855..	66	3	33.6	67	5	29 9	71	14	39.2	93	32	62 4	93	38	66.9	95	50	71 7
1856..	52	—14	20 1	55	—15	26 6	66	10	36.2	86	34	59.3	92	45	66.2	99	51	73 5
1857 .	46	—12	19 3	74	5	41.8	76	10	39 5	77	18	44.4	88	40	61 8	92	49	72.6
1858..	62	26	40.5	55	0	27 2	76	11	47.8	84	34	57.7	88	44	64 0	96	50	76.5
1859..	58	— 1	33.5	76	8	37.8	77	28	48.9	82	29	52.3	85	50	68 9	94	44	73 3
1860..	65	— 3	33.8	63	2	37 6	76	25	59.8	86	37	59 0	93	44	73.1	92	57	76.2
1861..	48	8	31.6	74	14	39 8	80	20	44.2	83	35	57.9	90	40	64.3	98	58	76 8
1862 .	42	4	29 4	56	— 1	30 1	79	19	43.3	80	37	54.1	90	45	68.6	96	52	73 6
1863..	65	12	37 4	63	2	35 8	76	23	43.7	82	52	56.5	90	40	67 0	90	51	70 6
1864..	71	—20	28.8	66	3	37.5	70	18	39.9	78	35	50.7	92	40	67.2	96	50	77.3
1865..	47	1	27 5	60	17	37 3	70	13	46 5	82	31	54.9	88	42	66.8	96	56	77.5
1866..	55	0	31.8	68	— 6	32.6	82	15	41.8	90	33	59.8	87	42	64.2	94	51	74 3
1867	58	5	25.5	68	5	39.4	68	1	33.4	85	33	55.6	80	36	60 5	94	56	73 1
1868..	62	0	25.6	67	6	34 6	82	16	50.1	80	26	50 4	90	44	66 5	99	50	74.7
1869..	62	23	37.2	70	8	35.8	76	4	37.3	84	28	53.9	92	41	64 6	96	49	71 [illegible]
1870..	63	8	32 9	66	— 4	35.6	64	8	39.9	88	27	57.8	97	43	71.0	102	49	76.0
1871..	65	4	33.5	71	14	39 3	79	31	49 6	89	36	60.6	97	38	67.2	101	56	78 [illegible]
1872 .	49	— 6	27.3	63	— 4	31.0	71	13	33 0	89	28	58.2	89	42	66 5	93	52	78.1
1873..	54	—23	23.7	65	— 4	31.9	71	6	42 1	88	33	51.1	88	40	65.2	95	58	77.9
1874..	66	— 2	33.9	62	11	34.5	77	19	42.4	79	27	47.1	94	45	69.6	98	52	78.8
1875..	47	—18	21.3	55	— 5	24.2	78	6	38 3	80	20	51.0	90	30	64.4	92	51	73.7
1876..	68	13	39.4	74	0	39 3	76	7	38 7	82	33	56.9	89	39	67.0	95	50	73.0
1877..	66	— 6	29.1	69	23	39 6	75	6	37.6	81	28	54.1	86	36	63 5	92	46	74 1
1878..	54	7	34.0	60	18	39.9	77	34	53 2	82	38	60 8	87	40	68.0	91	52	73 0
1879..	60	—16	26 8	62	— 2	32 8	83	10	46.6	85	23	55.3	93	44	69.7	96	51	73.6
1880 .	68	25	45.6	69	6	39.1	76	20	43.4	86	29	58 4	89	42	71.3	93	57	73.8
1881..	46	—12	22.2	63	3	30.4	65	20	39.0	86	24	51 7	90	43	71.5	....	....	.....
1837-1881 ...	......	......	31.8	......	......	35.3	....	....	44.0	....	....	56.2	....	....	66.4	....	....	74.7

PERATURES AT ST. LOUIS, MO., FURNISHED BY DR. GEO. ENGLEMANN.

degrees Fahrenheit.]

July.			August.			September.			October.			November.			December.		
Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
.....	.....	.....	...	.....	.....	....	.....	.....	.....	...	.....	...		.....		.....	.....
101	62	88.1	98	64	80.4	91	43	68.6	87	25	50.6	71	11	34.7	59	1	27.4
97	53	76.4	91	54	74.3	86	35	64.4	83	38	62.8	62	0	38.5	49	6	30.4
94	55	76.9	91	53	76.0	82	45	65.7	78	24	55.0	67	20	42.7	62	14	36.0
100	63	80.9	97	59	77.1	95	48	68.1	77	22	54.3	70	20	46.1	61	16	37.2
96	54	75.8	95	52	73.8	98	44	71.9	85	35	59.0	78	7	37.8	64	4	35.1
98	59	79.1	97	58	76.8	97	54	73.8	83	20	51.5	71	24	43.2	64	14	38.0
98	65	81.6	97	51	77.4	94	38	67.0	80	26	51.4	76	20	44.6	64	10	36.6
97	58	79.8	93	61	77.6	96	48	70.9	79	28	55.3	71	0	42.7	53	— 1	27.4
95	57	81.4	94	60	78.6	93	53	74.0	84	30	56.3	69	19	46.4	65	18	39.7
94	55	78.6	90	56	74.7	92	45	69.1	83	28	57.1	77	21	45.1	67	4	34.8
95	59	73.7	91	58	75.0	86	43	64.4	78	34	55.8	68	17	35.7	66	5	33.0
90	55	74.4	93	53	73.8	88	46	68.5	75	37	53.8	75	25	51.8	62	6	29.6
98	62	80.8	102	60	81.5	92	52	70.0	78	28	56.6	80	23	47.8	52	2	31.8
97	51	78.6	94	61	76.4	94	37	72.9	82	26	56.4	64	25	40.8	54	— 2	31.5
95	57	78.2	90	56	73.9	92	42	68.2	83	35	62.3	62	20	39.1	60	15	35.6
95	56	75.4	95	53	76.4	90	42	70.3	84	26	54.3	72	30	49.4	57	12	34.3
101	58	84.6	101	53	82.3	100	52	76.6	82	37	61.5	66	23	48.7	61	16	37.0
96	60	79.7	94	54	74.7	90	47	73.4	80	28	54.8	72	24	46.9	64	— 4	32.6
102	63	88.1	93	54	74.2	92	36	66.3	85	29	59.8	75	19	40.6	55	4	29.6
102	56	79.5	98	52	76.5	93	44	71.3	82	28	54.7	68	12	39.1	59	25	40.5
99	60	82.2	98	51	78.7	98	47	71.3	90	38	58.6	57	17	37.4	55	12	38.3
79	53	80.1	92	57	76.8	82	47	67.1	80	27	54.4	76	15	47.4	48	4	25.0
104	60	82.1	93	57	78.3	94	44	67.7	87	30	58.9	70	7	40.9	52	4	30.5
79	54	77.5	102	56	78.4	95	42	68.9	82	34	60.8	78	21	46.2	74	14	39.8
100	58	79.2	96	60	78.4	89	50	70.4	88	22	56.4	76	26	41.9	66	16	41.4
94	55	76.0	94	45	75.8	92	43	67.5	72	21	47.1	71	6	42.9	60	2	35.4
97	53	80.9	96	58	77.0	102	46	71.1	78	34	51.7	76	14	44.1	72	2	30.1
97	56	75.4	92	56	75.9	94	52	75.5	80	30	57.3	69	26	47.1	62	0	30.4
96	62	81.7	100	50	74.5	83	40	68.8	80	30	57.7	73	25	45.6	54	10	33.5
95	62	79.3	98	58	79.4	92	45	71.8	91	32	58.1	75	8	48.2	70	12	35.6
102	66	84.0	95	56	74.7	84	40	68.2	76	31	55.3	76	26	43.5	53	—11	27.9
98	57	78.0	98	56	97.4	88	42	67.1	73	23	47.5	76	22	39.3	52	10	32.1
102	58	82.6	98	57	76.1	93	54	71.2	81	34	58.3	75	22	46.5	58	—14	30.4
99	60	79.2	96	50	78.5	90	38	66.8	85	37	59.2	69	6	38.7	62	— 2	29.1
94	60	78.6	100	57	79.3	97	42	69.8	89	29	56.4	66	2	36.1	54	—20	23.3
96	57	77.7	99	58	78.4	90	42	66.9	89	22	51.7	72	13	40.3	68	14	35.9
98	62	81.1	98	61	78.3	90	47	69.6	83	29	55.8	77	10	42.9	62	13	35.3
97	65	78.0	88	55	72.7	92	39	66.0	82	27	53.9	70	13	40.0	74	— 3	41.9
94	57	79.0	94	55	77.9	92	50	68.1	81	31	55.6	78	16	39.3	57	— 5	23.3
94	58	78.7	94	56	75.1	87	46	68.8	85	37	59.1	64	11	41.1	69	19	46.8
98	64	81.6	.....	.....	78.8	....	.....	.....	84	24	55.8	...	...	46.2	56	— 6	26.3
100	63	81.4	.....	.....	75.1	83	48	64.8	90	29	63.1	79	20	46.8	62	— 2	32.5
.....	.....	77.2	.....	.....	78.0	.....	.....	65.7	.....	...	54.7	.....	...	32.1	....	.....	27.4
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	.....	.....	.....
......	...	77.2	......	.....	77.1	.....	.....	69.1	.....	....	56.0	...	..	42.7	....	......	33.3

ST. LOUIS, MO.

SMITHSONIAN AND SIGNAL SERVICE SERIES.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1836	30.3	31.8	37.9	58.2	66.9	74.8	78.7	78.3	67.1	47.8	40.2	29.4	53.2
1837	28.7	37.9	41.8	49.2	63.5	72.2	78.2	75.1	66.2	58.0	49.4	35.4	54.6
1838	34.1	20.2	50.1	58.1	60.5	75.8	81.7	80.2	67.9	50.0	34.1	26.8	53.3
1839	36.6	37.9	44.6	62.7	66.8	70.4	76.5	74.0	63.7	62.2	37.9	29.8	55.3
1840	25.7	39.2	46.8	60.7	67.3	77.4	77.0	75.7	65.0	54.4	42.1	35.4	55.6
1841	28.0	32.3	45.7	54.5	66.7	77.5	81.0	76.8	67.4	53.7	45.5	36.6	55.5
1842	39.1	36.8	56.3	62.6	66.8	72.8	76.0	73.0	71.2	58.4	37.2	34.5	56.1
1843	36.2	23.7	26.2	55.5	66.9	74.4	79.6	76.7	72.6	52.2	42.2	36.7	53.6
1844	31.9	38.7	44.2	65.6	67.1	75.5	81.7	76.0	67.2	50.9	44.2	36.2	56.6
1845	39.3	42.1	44.7	62.5	63.3	74.2	79.6	76.6	72.8	54.3	41.8	25.5	56.3
1846	37.6	29.5	46.3	58.8	69.2	71.0	80.7	78.1	73.0	54.8	44.2	33.3	56.6
1847	25.6	34.6	38.6	57.8	63.0	72.4	78.6	74.2	68.3	54.6	44.0	32.8	53.8
1848	37.2	33.9	43.2	58.0	67.7	72.9	75.2	74.7	63.5	54.7	37.6	31.3	54.2
1849	28.7	29.6	47.6	53.7	64.5	76.0	74.8	73.6	67.4	51.6	50.1	29.0	53.7
1850	35.3	35.2	42.4	49.0	62.5	76.2	79.9	79.6	68.1	55.2	45.8	30.7	55.0
1851	34.1	37.4	47.2	51.6	67.8	72.7	78.2	76.2	71.9	55.3	39.9	29.6	55.2
1852	27.7	38.9	47.2	52.2	66.7	72.0	78.4	78.6	67.8	60.8	38.4	34.2	54.7
1853	33.4	32.1	42.3	56.1	64.2	78.1	75.6	76.4	69.0	51.8	47.2	32.6	54.9
1854	26.8	38.0	46.7	56.0	66.9	75.3	82.8	81.6	75.5	60.1	42.3	35.6	57.3
1855	34.1	28.0	38.0	60.8	65.5	71.1	78.6	78.6	72.2	52.6	45.7	30.7	54.1
1856	18.4	25.0	34.8	58.2	65.4	77.4	82.4	78.4	65.6	58.8	39.9	29.3	52.4
1857	19.0	41.6	39.3	44.0	61.1	71.8	78.8	76.1	70.9	56.3	38.9	40.2	53.0
1858	40.2	27.0	47.6	57.3	63.3	75.7	81.5	78.3	70.9	58.2	37.4	33.0	56.3
1859	33.1	37.2	48.2	51.5	67.6	71.7	78.2	75.4	65.9	52.9	48.7	34.2	54.4
1860	32.7	36.8	48.6	57.5	70.0	73.4	80.8	78.3	67.7	59.2	42.0	31.3	56.5
1861	32.4	40.4	44.5	57.5	63.4	75.6	76.8	77.2	68.3	57.0	46.1	39.6	56.6
1862	29.7	30.2	44.0	54.1	68.3	73.0	79.2	78.9	70.8	54.3	41.6	41.2	55.6
1863	37.4	35.6	44.2	56.6	66.0	69.5	75.4	75.4	67.4	47.0	43.2	35.7	54.4
1864	29.1	37.8	40.5	50.8	67.6	76.8	82.2	76.6	70.6	51.4	43.8	30.0	54.8
1865	28.4	37.8	46.3	55.7	67.0	77.4	75.2	76.0	75.7	57.8	47.8	31.2	56.4
1866	32.6	33.2	42.2	60.1	64.1	73.8	81.1	74.6	63.4	57.7	45.9	33.7	55.2
1867	25.9	39.7	33.7	55.7	60.1	77.3	78.5	78.9	71.5	57.8	48.4	35.7	55.3
1868	25.8	34.7	50.2	50.7	66.0	73.9	83.4	74.7	63.8	55.2	44.4	28.9	54.3
1869	33.7	37.1	38.6	54.2	64.3	71.4	77.1	79.3	67.1	47.8	40.1	33.1	54.1
1870	33.6	36.1	39.9	56.5	68.6	73.6	79.9	75.2	71.0	58.5	46.8	31.0	55.9
1871	37.7	39.9	50.9	60.5	68.8	79.7	79.9	78.1	66.0	59.0	39.8	30.2	57.5
1872	28.3	32.2	37.8	57.3	67.4	76.4	79.1	79.5	69.8	57.4	38.5	25.8	54.1
1873	25.7	33.6	42.2	51.0	64.9	75.4	77.7	78.1	65.4	52.0	41.4	37.1	53.7
1874	35.2	36.1	48.7	47.6	69.1	78.9	81.5	78.2	70.0	58.0	44.0	37.5	56.6
1875	23.9	26.0	38.8	52.2	64.8	73.1	78.8	73.1	67.1	54.5	41.5	43.4	53.9
1876	41.5	40.8	39.8	57.2	67.0	73.0	79.3	77.4	66.6	55.7	40.8	24.9	55.4
1877	31.3	41.5	33.8	54.3	63.7	74.5	78.3	75.8	69.7	59.7	42.3	47.9	56.4
1878	35.8	41.1	53.9	61.3	63.5	73.0	81.7	79.0	69.0	56.6	47.1	27.1	57.4
1879	23.3	33.9	47.8	54.7	68.9	73.3	80.6	74.8	64.9	62.3	46.8	33.3	55.7
1880	45.7	39.2	42.9	57.3	69.5	73.4	76.8	77.0	66.2	54.6	31.9	27.1	55.1
1881	21.7	30.3	38.5	50.6	70.8	75.0	81.0	82.5	75.3	61.0	43.7	40.8	55.9
1882	32.1	43.9	47.1	57.6	59.5	73.4	73.8	74.0	68.3	61.0	44.6	32.3	55.6
1883	23.2	31.3	38.4	55.8	61.8	71.9	76.1	72.8	66.9	55.5	49.6	39.5	53.6
1884	25.8	35.5	43.6	53.4	64.5	72.8	77.3	74.4	73.9	62.8	47.1	32.8	55.3
1885	26.0	27.0	41.1	56.4	64.9	73.5	80.5	74.6	68.4	55.8	47.8	33.9	54.6
1886	24.8	35.1	44.5	59.1	69.4	74.2	80.4	79.9	72.1	61.8	45.6	29.8	56.4
1887	30.8	40.6	45.8	60.7	71.4	77.8	83.7	79.2	70.0	54.4	44.8	31.5	57.5
1888	24.3	32.2	40.8	58.7	63.1	73.2	79.0	73.2	64.5	52.6	43.6	36.6	53.5
1889	34.3	31.4	46.6	57.9	63.8	70.6	77.8	75.4	67.0	55.1	41.4	49.8	56.0
1890	39.2	40.2	39.0	57.2	68.8	79.4	79.8	74.7	65.0	57.3	48.6	37.6	56.3
Sums	1719.5	1922.8	2382.4	3077.7	3619.2	4085.0	4347.2	4200.6	3776.8	3072.8	2374.4	1869.2	3036.9
Means	31.4	35.0	43.3	56.0	65.8	74.3	79.0	76.4	68.7	55.9	43.2	34.0	55.2

SEDALIA, PETTIS COUNTY.

C. L. MITCHELL, C. G. TAYLOR.

Year.	January....	February...	March......	April.......	May........	June	July...	August......	September ..	October......	November...	December ...	Annual.. ...
1880..........	18.3	25.3	43.8	57.0	68.6	72.8	77.1	76 9	67.5	54.9	33.2	26.4	51.8
1881..........	20.3	28.1	38.5	50.9	73.5	77.8	79.4	85.4	75.9	60.3	42.5	40.9	56.1
1882......... .	31 8	45.9	46.7	58.0	60.1	77.5	74.4	77.3	69.3	61.0	44.5	31.9	56.5
1883..........	17.8	28 2	38.3	57.6	61.6	73.3	76.7	72.7	64.5	51.3	43.2	40.7	52.2
1884..........	17.8	27.6	42.6	52.1	63.2	73.5	77.8	73.2	73.4	46.0	45.2	25.0	51.4
1885..........	18.8	20.7	39.8	52.7	63.0	72.6	81.0	75.3	67.3	54.3	44.6	34.0	52.0
1886	17.2	31 8	42.5	56.4	69.1	72.8	80.7	80.4	71.7	61.4	42.1	25.7	54.2
1887..........	13.6	34.6	42.7	57.2	69.5	75.6	80.9	77.7	71.7	56.9	46.7	29.1	54.7
1888..........	23.8	36.2	43.1	61.5	66.9	76.2	82.8	76.6	68.8	57.2	45.9	37.0	56 4
1889..........	35.6	32.8	48.1	56.7	63.7	73.5	80.8	77.7	66.0	56.0	41.5	49.4	56.8
1890..........	32.7	35.5	38.3	56.4	64.0	80.8	80.0	73.1	63.8	56.2	46.3	37.3	55.4
Sums.......	247.7	346.7	464.4	616.5	723.2	826.4	871.6	846.3	759.9	615 5	475.7	377.4	597.5
Means......	22.5	31.5	42.2	56.0	65.7	75.1	79.2	76.9	69.1	56.0	43 2	34.3	54.3

SPRINGFIELD, MO.

E. M. SHEPHERD AND SIGNAL SERVICE.

1871.........	.....	.....	.....	.....	.....	.....	77.0	74.4	63.4	55.1	37.4	27.4	......
1872.........	24.6	32.8	38.8	56.0	64.5	74.3	76.8	... .	.....	.....	.....	.....	......
1882.........	37.2	46.2	50.6	58.5	59.7	74.9	73.6	72.5	66.9	61.2	45.9	35.9	56.9
1883.........	28.1	34.8	42.2	57.2	62.5	.....	.....	.....	.....	.....	.....	.....	......
1884.........	.....	.....	48.9	56.4	65.5	73.3	80.5	74.2	73.4	59.9	45.6	31.8	.....
1885.........	29.1	27.4	42.1	56.9	61.6	77.3	77.6	73.6	65.6	.....	41.5	38.0	......
1886.........	21.5	.....	42.7	53.4	68.4	.. .	78.9	76.6	65.5	58.6	.....	27.3	......
1887.........	34.5	39.0	45.8	59 4	65.2	70.9	71.3	76.8	70.3	54.7	45.8	31.5	55.4
1888.........	27.5	37.0	41.5	59.0	62.1	70.9	79.0	74.2	66.0	54.2	43.2	38.2	54.4
1889.........	35.5	32.6	46.2	57.2	62.8	69.0	76.9	73 0	64.4	56.6	41.0	51.8	55.6
1890.........	39 4	40.2	42.6	58.2	64.6	75.6	78.2	73.6	63 4	56.3	48.2	40.0	56.7
Sums......	252.8	257.2	402.6	516.2	572.4	511.9	616.0	594.5	535.5	401.5	311.2	294.5	279.0
Means.....	30.8	36.3	44.1	57.2	63.7	73.3	77.0	74.3	66.5	57.1	43.6	35.8	55.8

WET GLAIZE, CAMDEN COUNTY.

A. Y. CARLETON.

1872..........	30.1	35.5	.....	60.2	66.1	73.4	76.5	75.6	67.6	55.1	.....	24.2	.....
1873	26.2	34.4	43.4	51.4	64.8	74.8	76.6	76.3	65.1	48.6	44.6	36.6	53.6
Sums	56.3	69.9	.....	111.6	130.9	148 2	153.1	151.9	132.7	103.7	.....	60.8	.....
Means......	28.2	35.0	.....	55.8	65.4	74.1	76.6	76.0	66.4	51.8	.....	30.4	.....

WARRENTON, WARREN COUNTY.

M. F. Hamaker, C. Laissig, Jno. M. Frick.

Year.	January....	February...	March......	April.......	May....	June........	July....	August.....	September..	October....	November..	December..	Annual.....
1859.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	51.0	45.5	24.0	.....
1860.........	31.8	36.0	46.0	57.1	70.4	74.6	81.3	75.0	65.3	54.3	38.0	27.3	54.8
1861.........	29.0	(38.1	42.4	57.1)	62.2	75.4	(76.3	75.3)	64.7	53.6	43.1	36.8	54.5
1862.........	27.3	28.7	41.6	52.3	59.3	71.2	78.1	75.8	68.8	54.8	39.2	38.6	53.0
1863.........	35.1	32.8	42.5	56.0	65.1	70.3	75.0	.....	.....	.....	.....	.....	.....
1883.........	.....	.....	.....	.....	.....	.....	79.0	76.3	68.9	57.2	47.5	.....	.....
1886.........	.....	28.5	40.4	56.7	66.7	.....	75.5	77.8	.....	.....	.....	.....	.....
1888.........	21.0	32.5	38.8	63.0	66.0	.....	.....	.....	.....	50.0	38.9	32.9	.....
1889.........	35.2	25.4	.....	.....	.....	.....	.....	.....	.....	51.0	39.9	45.6	.....
1890.........	34.2	33.6	35.4	56.4	64.8	79.6	82.1	.....	62.6	50.6	45.0	33.0	.....
Sums	179.4	155.4	209.3	228.4	323.0	291.5	388.9	304.9	267.7	372.4	253.2	205.2	.....
Means	29.9	31.1	41.9	57.1	64.6	72.9	77.8	76.2	66.9	53.2	42.2	34.2	.....

WYACONDA PRAIRIE, LEWIS COUNTY.

G. P. Ray.

1862......	(22.9)	(24.0)	36.6	48.0	63.3	70.5	76.6	75.5	66.9	51.4	36.2	34.0	(50.5)
1863......	(30.2)	28.3	37.6	(51.1)	63.5	69.1	75.4	74.9	65.7	43.0	37.9	28.0	(50.4)
1864......	19.2	30.9	34.3	47.3	65.1	72.7	76.6	72.5	67.3	48.2	37.6	22.9	49.6
1865......	21.6	32.4	36.7	50.3	63.3	73.4	71.6	75.3	74.0	55.0	40.6	22.3	51.4
1866......	24.9	24.2	34.6	.....	.....	.....	79.6	70.3	.....	.....	.....	.....	.....
1867......	.....	31.8	27.3	(49.7)	.....	.....	.....	.....	.....	.....	.....	.....	.....
1868......	(17.4)	(27.3)	47.1	46.4	64.0	71.5	81.3	69.4	62.3	51.5	40.6	25.6	(50.4)
Sums ..	65.7	147.6	254.2	292.8	319.2	357.2	461.1	437.9	336.2	249.1	192.9	132.8	101.0
Means..	21.9	29.5	36.3	48.8	63.8	71.4	76.8	73.0	67.2	49.8	38.6	26.6	50.5

TEMPERATURE.

ATHENS, CLARK COUNTY.

Year.	January....	February....	March....	April....	May....	June....	July....	August....	September..	October....	November..	December..	Annual....
1863			47.9			72.8	81.2					30.6	
1864	22.6	38.4	42.6	49.6	61.2	75.0	80.7					27.1	
1865	30.4	37.9	41.5	48.6	61.7	67.0	76.1	78.0	75.4	54.4	46.3	27.5	
1866	30.7	29 1	37.4	55.2	62.3	74.4	83.2						

BOLIVAR, POLK COUNTY.

J. W. Farmer.

1868													31.0
1869	38.2	37.8	41.2	57.6	66.2	72.0	78.1	81.1	68.8	53.0	47.6	37.3	56.6
1870	34.7												
1883			45.0	58.0	53.0	70.0	78.0	78.0	64.2	65.0	49.1	39.7	
1884	28.6	34.8	42.8										

BRUNSWICK, CHARITON COUNTY.

1845	40.2	42.5	47.0	63.5	67.5	73.0	81.0	77.5	70.0	55.5	41.2	47.2	58.8

CANTON, LEWIS COUNTY.

G. P. Ray.

1867					56.8	75.8	79.3	77.6					
1868	18.8	28.8		48.5									

CAPE GIRARDEAU, CAPE GIRARDEAU COUNTY.

Rev. J. Knoud.

1.856										59.9		34.2	
1.857	25.9	35.1	38.3	46.1	60.2	70.7	76.0	74.6	69.5	54.6	42.1	43.3	(53.0)
1.858	42.7												
1.890									61.9	62.9			

CARTHAGE, JASPER COUNTY.

D. Mathews and J. G. Breaser.

Year.	January....	February....	March	April........	May..........	June........	July..........	August	September ..	October.......	November...	December....	Annual......
1884.........	22 0	32.5	44.7	52.3	63.7	68.8	78.4	77.1	71.8	.....	45.3	28.2	......
1885.........	23.9	24.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	......
1889.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40.1	52.2	......
1890.........	39.1	38.3	42.9	58.7	63.4	75.2	79.8	.....	.....	56.4	47.3	39.5	......

CASSVILLE, BARRY COUNTY.

M. L. Wirick and Geo. E. Harris.

1859.........	.....	.....	.....	.....	.....	.....	.....	76.1	67.8	60.7	51.7	29.5	......
1860	36.0	43.4	52.2	61.7	68.7	74.6	80.6	77.9	67.9	55.4	41.8	35.8	(58.0)
1861.........	.....	41.8	47.7	55.7	64.6	75.6	.....	.....	.....	.....	.....	.....	......
1890.........	.....	.....	.....	.....	62.4	73.8	76.7	73.4	64.6	54.0	48.3	38.6	......

CAVE SPRINGS, GREENE COUNTY.

T. W. Coltrane.

1871.........	31.7	39.6	48.2	57.9	61.9	75.0	76.0	69.2	63.4	54.4	36.5	26.2	53.3
1872.........	24.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	......
1873.........	.....	.....	.....	.....	.....	.....	77.8	77.6	66.0	52.3	44.4	35.5	......

CRAIG, HOLT COUNTY.

Wm. Kaucher, C. F. A. Day.

1886.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	57.9	36.1	20.1	......
1887.........	13.8	22.1	.....	.....	.....	.....	.....		.....	.....	.....	27.1	......
1888.........	11.1	26 7	30.9	55.8	59.6	72.1	80.9	.....	.....	.....	.....	.....	......
1889.........	27.9	24.8	39.2	.....	.....	.....	.....	.....	.....	.....	42.6	45.4	......
1890.........	21.0	28.3	35.1	.....	61.6	75.6	.....	.....	.....	.....	.....	.....	......

DRESDEN.

R. A. S. Wade.

1884.........	.....	.....	43.1	50.3	62.5	73.2	77.9	74.6	71.2	58.2	40.9	.....	......

DUNDEE, FRANKLIN COUNTY.

S. S. BAILEY.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1860	28.5	33.8	38.7	51.2	71.8	75.0	81.4	79.6	.....	.....	.....	.....	......

EASTON, BUCHANAN COUNTY.

P. B. SIBLEY.

1864	.....	.....	.....	.....	.....	.....	.....	..	68.3	48.0	36.0	21.4	......
1865	22.8	30.5	42.2	54.0	68.2	75.8	74.2	75.1	73 3	56.1	46.2	22.5	(53.4)
1866	25.6	28.0	.....	.....	.....	. ...	78.6	74.0	59.8	55.4	43.6	.....	......

FAYETTE, HOWARD COUNTY.

DR. T. BERRY SMITH.

1887	23.5	.....	.....	.....	.....	.....	.....	77.0	69.1	53.6	43.5	28.6	......
1888	20.6	33.5	39.7	58.1	62.0	.....	.....	.....	70.7	54.5	43.1	35.7	......
1889	31.8	29.4	45.4	56.2	63 8	...	.....	.....	.....	51.7	39.4	47.1	......
1890	33.4	36.1	36.4	56.0	62.8	77.1	79.5	73.6	63.8	55.3	44.8	35.0	54.5 ......

HIGH HILL, MONTGOMERY COUNTY.

W. S. CHAPIN.

1873	20.5	27.4	39.9	48.4	62.5	74.8	74.8	75.2	61.2	47.0	38.0	.....	......

HORNERSVILLE, DUNKLIN COUNTY.

W. HOMER.

1860	38.0	45.0	55.2	65.6	74.3	79.0	83.2	79.5	73.9	61.8	48.5	42.4	(62.2)
1861	.....	47.9	52 8	60.6	.....	.....	.....	.....	.....	.....	.....	.....	......

KEYTESVILLE, CHARITON COUNTY.

C. VEATCH, H. H. MANN.

1869	.....	.....	.....	.....	62.4	69.4	74.9	77.2	64.8	44.8	.....	.....	......
1871	.....	35.3	47.2	59.1	69.3	.....	.....	.....	.....	.....	.....	....	......
1873	.....	.....	.....	47.8	58.4	75.0	75.1	.....	.....	.....	.....	.....	......

LAMONTE, PETTIS COUNTY.

JNO. S. SLAVEN.

Year.	January.....	February ...	March.......	April	May..........	June	July...........	August......	September...	October......	November...	December...	Annual.......
1888..... ...	.....	.....	46.2	61.8	.....	.....	81.1	75.5	73.0	58.1	44.7	36.5	.....
1889.........	32.3	29.6	46.2	56.8	.....	77.9	79 3	72.2	69.2	62.2	42.8	48.2	.. ...
1890.........	33.7	....	.....	52.7	63.1	77.5	81.1	72.2	.....	56.7	44.8	36.5	......

LAWRENCE, LAWRENCE COUNTY.

W. HARRIS.

1871.........	.....	.....	.....	.....	.....	... .	77.0	75.7	66.8	57.0	39.3	29.4	......
1872.........	27.0	.....	.....	.....	66.9	74.5	77.6	75.8	68.0	56.2	36.3	24.5	......
1873....	25.4	33.0	43 2	49.9	63.6	76.2	76.6	75.3	65.2	49.6	43.8	35.5	53.1

LEBANON, LACLEDE COUNTY.

M. W. SERL.

1878.........	.....	.....	.....	.....	.....	71.1	80.5	80.7	67.2	55.4	45.4	24.7	......
1879.........	27.6	37.7	49.1	56.1	68.1	.....	80.3	70.1	73.0	63.0	38.1	.....	......
1880.........	.....	36.0	.....	.....	77.0	.....	.....	.....	.....	.....	.....	.....	......
1890.........	39.0	40.1	43.2	57.0	65.6	79.0	80.5	75.9	65.1	58.0	50.8	43.1	58.1

MACON CITY, MACON COUNTY.

J. T. RIDGEWAY, HOMER B. MOORE.

1883.........	.....	.....	.....	54.9	60.4	69.5	69.7	....	52.8	.....	.....	.....	......
1887.........	.....	.....	.....	.....	59.0	.....	....	.....	.....	.....	.....	... .	......
1889.........	30.0	.....	43.0	... .	.....	.....	.....	.....	.....	.....	.....	.....	......

MOUND CITY, HOLT COUNTY.

LAWRENCE KAUCHER.

1886.........	.....	.....	.....	53.9	63.9	66.0	79.1	79.8	69.5	60.5	39.5	22.3	.....
1887.........	17.4	26.3	40.3	57.8	69.4	73.4	.....	.....	.....	52.1	42.4	25.0	......
1888.........	.....	.....	.....	50.9	.....	.....	.....	.....	.....	.....	.....	32.8	......
1889	25.9	27.5	.....	56.6	.....	.....	.....	....	.. ..	.....	.....	.....	......

NEVADA, VERNON COUNTY.

P. J. Bond, Prof. W. A. Buckner.

Year.	January...	February...	March	April......	May........	June	July........	August	September..	October	November...	December...	Annual ......
1871.........	.....	.....	.....	.....	.....	.....	.....	.....	67.2	57.3	37.9	28.0	......
1872.........	27.4	35.4	38.6	57.4	65.2	74.9	79.5	81.1	68.7	58.7	35.0	.....	......
1873.........	23.2	31.9	44.0	47.4	59.7	75 4	76.2	75.8	.....	48.9	.....	22.6	......
1889.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50.0	......
1890.........	.....	.....	....	.....	.....	.....	81.7	75.4	64.8	.....	.....	.....	......

NEW FRANKFORT, SALINE COUNTY.

Geo. W. Hawkins.

1888.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	49.3	37.9	34.8	......
1889.........	29.9	27.8	40.9	51.7	67.4	69.6	78.4	75.9	62.2	55.0	38.0	46.3	......

PALMYRA, MARION COUNTY.

G. R. Comings.

1856.........	.....	.....	.....	.....	.....	78.8	80.0	73.6	65.0	60.5	38.0	25.5	......
1857.........	.....	.....	.....	39.9	57.0	68.0	76.1	72.2	72.1	.....	.....	.....	.....

PARIS, MONROE COUNTY.

W. T. Maxey.

1859.........	... .	.....	.....	.....	.....	.....	.....	72.5	63.0	51.4	44.0	20 8	......
1860.........	29.7	33.8	46.7	56.0	67.9	71.8	.....	.....	.....	.....	.. .	.....	......
1861.........	26.5	35.2	40.9	54.2	60.3	72.0	71.3	73.9	65.6	55.2	43.4	36.3	(52.9)
1862.........	21.5	.....	.....	.....	.....	.....	... .	.....	.....	.....	.....	....	......

PHELPS CITY.

J. S. Wade.

1884.........	.....	24.1	38.6	50.9	64.6	74.1	77.8	72.5	71.5	58.6	39.1	19.6	......
1885.........	13.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	......

PEIRCE CITY, LAWRENCE COUNTY.

J. J. SPILMAN.

Year.	January	February	March......	April.......	May	June........	July...	August......	September ..	October.....	November ..	December ..	Annual.....
1888.........	29.3	39.8	46.0	60.8	64.8	73.7	80.4	76.0	67.1	55.4	42.4	38.4	......
1889.........	35.7	32.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	......

PLEASANT HILL, CASS COUNTY.

G. C. BROADHEAD.

1878.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22.8	......
1883...	.....	.....	.....	.....	.....	72.8	79.7	72.0	71.5	53.3	.....	37.0	......
1884........	.....	. ..	.....	.....	65.8	.....	78.5	73 0	71.0	.....	.....	.....	......
1885.........	16.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	......
1886.........	12.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	......

RICHLAND, PULASKI COUNTY.

S. S. GOODWIN.

1872.........	.....	.....	.....	.....	.....	78.8	81.9	81.2	72.4	59 9	.....	24.3	......
1873.........	25.8	34.4	43.6	51.1	66.1	76.5	77.8	77.1	66.8	48.6	42.9	.....	......

SPRINGFIELD, GREENE COUNTY.

E. F. COPP.

1887.........	38.7	34.3	42.2	50.9	63.6	62.0	71.3	66.8	70.3	53.9	44.8	33.7	......
1888.........	27.8	44.0	42.7	59.9	63.6	71 5	78.2	74.9	65.8	. ...	40.9	39.4	......
1889.........	36.7	33.9	47.1	59.0	64.9	70.6	.....	.....	. ...	.....	.....	.....	......

ST. CHARLES, ST. CHARLES COUNTY.

L. C. SAEGER.

1887.........	.....	....	.....	.. .	.....	.....	.....	.....	.....	50.0	43.5	30.2	......
1888.........	22.6	31.2	39.4	59 2	63.8	73.6	78.9	75.0	65.1	53.7	45.8	35.1	......
1889.........	34.1	30 2	44 9	.....	62.0	.....	....	75.0	63.5	54.1	.....	.....	......
1890.........	33.6	39.0	38.1	56.3	57.4	74 9	80.0	73.0	66.5	53.8	47.4	37.1	54.8

STEELVILLE, CRAWFORD COUNTY.

E. A. Pinnell.

Year.	January...	February...	March.....	April......	May........	June........	July........	August......	September..	October.....	November..	December...	Annual.....
1887	.....	.....	.....	.....	.....	.....	.....	76.5	.....	.....	.....	.....	......
1888	27.3	35.7	.....	.....	.....	.....	77 7	73.1	.....	.....	.....	.....	......
1889	.....	.....	.....	.....	.....	64.0	76.1	.....	60.8	47.7	41.6	52.5	......

STOCKTON, CEDAR COUNTY.

W. Wells.

1859	.....	.....	.....	.....	.....	.....	.....	80.2	68.7	57.4	49.5	25.2	......
1860	.....	40.9	52.7	63.4	72.5	... .	85.9	.....	.....	.....	.....	29.0	......
1861	.....	44.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	......

TOWER GROVE, ST. LOUIS COUNTY.

A. Fendler, S. O.

1861	30 0	38.2	42.5	55.7	61.5	73 3	73.6	74.7	65.7	53.9	43.8	37.3	54.2
1862	27.4	28.0	41.9	52.3	65.3	70.5	76.6	76.5	68.3	53.4	39.4	38.6	53.2
1863	.. ..	33.1	42.0	.....	63.6	67.2	.....	.....	.....	.....	.....	.....	......
1864	26.2	.....	.....	.....	... .	.....	.....	.....	.....	.....	.....	.....	......

TROY.

I. A. Ward, W. S. Obs.

1887	.....	.....	44.3	54.7	68.0	68.7	77.0	75.2	67.6	52.2	41.5	29.4	......
1888	21.3	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	33.1	29.1	42.8	.....	.....	....	.....	.....	.....	.....	.....	.....	......
1890	31.7	33.1	32.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	......

UNION, FRANKLIN COUNTY.

B. Moore.

1866	30.3	32.1	41.5	58.2	62.0	71.6	79.3	72.2	61.6	54.2	44 7	33.6	(53.4)
1867	25.0	37.3	33.6	55.3	60.4	74.5	.....	.....	....	.....	.....	.....	.....

WARRENSBURG, JOHNSON COUNTY.

J. E. Pollock, Geo. L. Osborne.

Year.	January....	February...	March......	April.......	May.........	June........	July.........	August.....	September..	October....	November..	December..	Annual.....
1868.........	.....	.....	.....	.....	.....	.....	85.0	74.2	65.0	56.1	41.9	25.9	......
1869.........	33.9	33.4	38.1	53.8	65.2	71.9	77.0	80.2	.....	.....	.....	.....	.....
1887.........	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25.6	......
1888.........	18.5	29.8	.....	56.4	61.0	.....	.....	.....	.....	52.4	....	33.3	......
1889.........	28.5	.....	.....	53.7	.....	69.4	.....	73.1	63.3	52.0	36.7	45.1	......
1890.........	30.7	33.0	36.2	54.5	60.0	76 3	79.9	72.2	63.9	55.3	49.9	43.3	54.6

WILLOW SPRINGS, HOWELL COUNTY.

Wm. Hughes.

1889.........	.....	31.2	45.6	55.8	67.1	69.5	.....	77.1	67.6	57.2	43.0	52.4	......
1890.........	42.6	.....	43.5	59.6	68.4	76.9	78.2	72.9	64.2	57.1	50.3	37.1	......

MEAN AND EXTREME DAILY TEMPERATURES IN ST. LOUIS

During forty-seven years, as calculated from daily observations.[*]

BY DR. GEORGE ENGELMANN.

Half a century has passed since I began to study the meteorology and climatology of this neighborhood, and since the year 1836 I have made regular meteorological observations, first on temperature, the winds and the condition of the sky, and soon afterward on atmospheric pressure, rainfall and humidity.

I give here the results of my thermometrical observations, which I consider as the most important and most interesting of the series. They comprise, to be sure, only forty-seven years, and I might have waited until at least half a century was completed; but the results would scarcely have been different, and the task then perhaps problematical of accomplishment.

The observations were made within the city of St. Louis, and thus can not claim precision for this whole region. St. Louis, to be sure, was, when they commenced, a small town of perhaps 15,000 inhabitants, while now, at their completion, it is a large city of probably 400,000, with the necessary accompaniment of brick and stone, and especially with the smoke of thousands of chimneys, furnaces and factories, and the almost total absence of verdure. It has been held by some that these influences had little effect on temperature, but that brisk breezes would soon dispel smoke and equalize temperature. This, however, is not quite so, and direct thermometrical comparisons prove that the extreme temperatures, and, remarkably enough, even the extreme heat, are less marked in the city than in the country, and that the mean temperature is higher in the city than in the country (Trans., vol. 2, p. 70); but, aside from instrumental observation, the state of the vegetation proves it every spring and fall, when we find in our city gardens the plants uninjured on mornings when in the country they have suffered from late or early frosts.

St. Louis lies very nearly in the center of the Mississippi Valley, 600 miles north of the Gulf of Mexico and just as far south of Lake Superior, about 500 miles west of the Alleghenies and 800 miles east of the Rocky Mountains; its Washington University, one mile west of the river, lies in lat. 38° 38′ 03″ and long. 90° 12′ 15″; the low-water mark of the Mississippi is 379 feet above the gulf, and the foot of Market street (city directrix) is 413 feet above the same.

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[*] Trans. St. Louis Acad. Science, vol. IV, No. 3, pp. 496 to 508.

My observations were made in the first twelve years on the south-east corner of Second and Chestnut streets, only two blocks from the river and 75 feet above low-water mark of 1863; for the next twenty-two years on the south west corner of Fifth and Elm streets, five blocks from the river and 110 feet above low-water mark; and for the last thirteen years on the north west corner of Thirtieth and Locust streets, two miles from the river and 177 feet above low-water mark. When I was absent from the city, Dr. A. Wislizenus, and lately Mr. B. D. Kribben, have kindly filled the gaps.

My instruments were at first such as could then be obtained here; soon I imported correct thermometers fron Europe, and for nearly forty years I used those made by James Green, then of Baltimore, and soon afterward of New York.

For many years the observations were made at different periods of the day, and especially at hours when the extremes might be expected to occur, viz., at sunrise and at 3 p. m.; and the maximums and minimums were selected from all of them, often eight in a day, at whatever hour of the day they were found. Differential thermometers were observed only since the last 12 years. Thus I may not always have noted the absolute extremes of each day, and my tables can claim only approximate reliability; I give them for what they may be worth, but I can assure my readers that they furnish a record elaborated with zeal, conscientiousness, care and assiduity, and for a length of time such as probably few others, if any, exist in this valley.

The arrangement of the tables explains itself. The first two columns represent the means of the 47 minimum and of the 47 maximum observations made on each day of the year, and the third column the mean calculated from the two former. The next "Min." column gives the lowest and the "Max." column the highest temperature ever observed on that day; the column of years next to these gives the year in which these extremes did occur. The last column represents a supposed—or estimated—true mean for the day, after eliminating excessive extremes.

The year has been divided into 73 periods of 5 days each, the means of which are given in the footings for each. It will be seen, however, that the means of these periods do not progress, rise and fall, much more evenly than the single daily means; compare, *e. g.*, the mean of Jan. 31st to Feb. 4th, which is so much lower than the mean of the foregoing or the following five days that one might suspect a regular and normal decline of temperature in these days, and not a mere accident.

A few facts must strike every one who examines the tables. The first is, that a time even as long as 47 years fails to give us anything approaching absolute and reliable means; and we come to the painful conclusion that observations even continued for double that time, or for a century, may not yet obtain that desirable object. It seems that the excessive extremes of one or of a few days, such as we often observe in our climate of extremes, especially in the winter season, will influence—or, I may say, vitiate—the means of a long series of observations; and the question with me arises, whether such extremes ought not to be eliminated from the series, and thus truer means be obtained. At the same time we may justly be astonished that from such heterogeneous data so much order and system result; which gives us hope that we cannot be quite on the wrong track.

Another fact, which strikes us in looking over the tables, is that the mean temperatures do not increase and decrease evenly, but sometimes quite rapidly, and at other times they may become almost stationary for a time. These points come out most strikingly on a diagram which embodies the essential parts of the results and shows the daily progress of the temperature. Thus we find very little change from the middle of December to the first part of February, though the temperature proves to be lowest from January 4th to 13th; then we notice a rapid rise from Feb. 6th to 20th, a slower rise to the middle of March, then a rapid one to the end of the month; in the forepart of April a slow and after the middle of that month a very marked one; then follows a tolerably even, at last quite slow, rise to July 9th, when between this date and the 18th the greatest elevation of the curve is obtained. After that the mean temperature falls slowly to the middle of August, followed by a more rapid decline to the end of September; after a slight pause in the first week in October, a more rapid fall takes place for the following two weeks, and a slighter one in the two weeks succeeding them. After that the temperature sinks rapidly to about Dec. 10th, from which time till the beginning of February the changes are not very marked.

The mean temperature of April 17 to 19 and from October 12 to 17 correspond with the mean of the year.

The tables, and still more distinctly the diagram, show us also that the extreme highest and lowest temperatures diverge most in winter and least in summer, and that their values are much more variable in the former than in the latter season. The possibilities of range from the middle of December to the middle of March are 80 to 95 degrees, while in June and July they amount only to 40 or 45 degrees.

The same law is found when we compare the actually observed lowest minimum and highest maximum of every month; their divergence is greatest in January, and least, not much more than half, in July.

	Min.	Max.	Range.		Min.	Max.	Range.
January	—22.5	72.0	94.5	July	53.0	104.0	51.0
February	—15.0	76.0	91.0	August	45.0	104.0	59.0
March	0.0	86.0	86.0	September	35.0	102.0	67.0
April	18.0	99.0	81.0	October	19.5	91.0	71.5
May	29.0	97.5	68.5	November	— 0.5	81.5	82.0
June	43.0	101.5	58.5	December	—19.5	72.5	92.0

Nearly the reverse is the case—*i. e.*, the range in winter is much smaller than that in summer—if we compare the difference of the average daily minima and maxima for each month:

January	13.27	April	18.29	July	18.24	October	18.00
February	14.72	May	18.77	August	17.75	November	14.06
March	16.40	June	18.14	September	19.05	December	11.97

The range, it will be seen, is, on the whole, least in the cooler and greatest in the warmer months of the year; but this difference is not due to the lower or higher temperatures of those months, for it will be seen that in December the range is the smallest (smaller than in January) and in September greatest (greater than in July). This variation in the range of maxima and minima is undoubtedly owing to the condition of the sky in the different months. Gloomy weather prevails in the beginning of winter, and a clear sky with abundant evaporation, and thus a reduction of night temperature, in the autumn. The little table can give us an indication of the prevailing weather in the different months. Thus the difference, and its cause, the clearness of the sky, rises from December gradually till May, falls a little in June and July and more in August, rises to its highest point in September, is yet high in October, and then falls rapidly till December, to rise again in January.

The temperature of our continental locality shows a great difference from that of the western coast of Europe; as a convenient example we may refer to the temperature of London. Their winters are warmer from the latter part of November until the beginning of March, and their summers much cooler from this period to the latter third of November; and the mean is much higher here:

	January.....	February....	March........	April.........	May	June	July...........	August.......	September...	October......	November...	December...	Annual.......
St. Louis	31.8	35.4	43.7	56.2	66.3	74.7	79.2	76.8	69.0	56.1	42.8	33.4	55 4
London..	37.2	39.3	42.7	48.1	54.5	60.8	63.6	62.0	57.6	50.4	42.7	39 7	49.9
Diff'nce.	+5.4	+3.9	—1.0	—8.1	—11.8	—13.9	—15.6	—14.8	—11.4	—5 7	—0.1	+6.3	—5.5

Mean and Extreme Temperature in St. Louis from 1836 to 1882.

1836–1882.	Mean values for each day.			Extreme maxima and minima observed on each day of the year.				Supposed true mean......
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Jan. 1........	23.55	36.77	30.16	—22.5	1864	68.0	1876	31.5
2........	25.35	37.97	31.66	—13.0	1879	65.5	1855	31.3
3........	25.54	38.55	32.04	—15.5	1879	66.5	1874, 1880	31.0
4........	23.95	35.82	29 88	— 6.0	1879	63.5	1880	30.5
5........	23.45	39.22	31.83	— 8.5	1864	62.0	1876	30.2
	24.36	37.66	31.01	—13.1	....	65.1	....	30.9
6........	23.76	37.63	30.69	— 9.0	1879	64.0	1880	30.0
7........	22.33	33.95	28.14	— 1.0	1881	64.0	1839	29.4
8........	22.75	34 61	28.68	— 6.0	1877	68.0	1876	29.0
9........	22.65	35.48	29.06	—18 0	1875	65.5	1876	29.0
10........	22.67	34.82	28.74	—11.0	1881	70.0	1839	29.5
	22.83	35.29	29.06	— 9.0	....	66.3	....	29.4
11........	25.42	39.20	32.31	— 1.0	1881	71.0	1839	30.0
12........	26.69	39.27	32.98	— 2.0	1852	65.0	1863	30.2
13........	24.61	36.81	30.71	0.0	1852	59.0	1863	30.6
14........	25.61	38.11	31.86	—12.5	1881	64.0	1848	31.0
15........	26.71	39.67	33.19	— 2.5	1875	66.0	1847	31.4
	25.80	38 61	32.21	— 6.0	....	65.0	....	30.6
16........	24.03	36.27	30.15	2.0	1841	63.0	1845	31.8
19........	21.09	34.27	27.68	—11.0	1841	64.0	1842	32 0
18........	21.65	34 32	27.98	—12.5	1857	66 0	1842	32.0
19........	23.63	38.09	30 86	—12.0	1852	61.0	1843	32.0
20........	27.83	39.54	33.68	— 1.5	1866	64.0	1843	32.0
	23.64	36.49	30.07	— 7.0	....	63.6	....	31.9
21........	25.97	38.79	32.38	— 3 0	1854	67 0	1843	32.0
22........	23.84	39 19	31.52	— 2.5	1857	62.0	1858	32.0
23........	24.63	38.36	31.49	0.0	1854	62.0	1864	32.0
24........	25.57	39.64	32.60	2.0	1873	65.0	1860	32.2
25........	27.26	41.63	34.44	— 5.5	1840	65.0	1864	32.4
	25.45	39.52	32.48	— 1.8	....	64.2	....	32.1
26........	26.76	40.36	33.56	1.0	1865	71.5	1843	32.6
27........	26.96	39.53	33.24	— 0.5	1873	72.0	1864	32.6
28........	24.85	39.15	32.00	— 6.5	1873	67.0	1864	32.7
29........	25.32	39.30	32.31	—23.0	1873	64.5	1852	32.8
30........	24.79	41.09	32.94	— 2.0	1856	64.5	1842	32.8
	25.73	39.88	32.81	— 6.2	....	67.8	....	32.7

TEMPERATURES IN ST. LOUIS—Continued.

1836-1882.	Mean values for each day.			Extreme maxima and minima observed on each day of the year.				Supposed true mean........
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
31........	24.96	38.20	31.58	2.0	1875	65.5	1877	32.8
Feb. 1........	23.32	37.20	30.26	— 8.5	1836	70.0	1854	32.8
2........	23.55	85.77	29.66	— 3.5	1873	56.0	1846	32.9
3........	21 71	35.72	28.72	—15.0	1856	62.5	1852	32.9
4........	22.01	36.51	29.26	—11.0	1856	61.0	1837	33.0
	23.11	36.68	29.89	— 7.2	....	63.0	....	32.9
5........	24.67	39.29	31.98	— 3.5	1856	61.0	1837	33.0
6........	26.00	41.04	33 52	3.0	1843	67.0	1855	33.1
7........	26.08	41.19	33.63	— 3.5	1872, 1875.	65.0	1851	33.1
8........	24.74	39.98	32.36	2.0	1842	66.0	1847	33.2
9........	24.37	40.05	32.21	— 5.0	1875	72.0	1876	33.3
	25.17	40.31	32.47	— 1.4	....	66.2	....	33.1
10.......	25.92	41.56	33.74	1.0	1841	73.0	1876	33.5
11........	29.98	43.93	36.95	2.0	1841	73.0	1845	33.7
12........	29.00	43.44	36.22	2.0	1841	70.5	1882	33 9
13........	29.06	40.41	34.73	4.5	1838	69.0	1867	34.0
14........	24.71	39.38	32.04	— 3.5	1866	64.0	1857	34.1
	27.73	41.74	34.73	1.2	....	69.9	....	33.8
15........	26.53	41.09	33.81	— 9.5	1866	68.0	1848	34.2
16........	26.07	42.59	34.33	— 5.0	1866	63.5	1857	34.4
17........	28.03	41.18	34.60	— 4.0	1838	74.5	1857	34.6
18........	28.05	42.39	35.22	— 2.5	1849	65 5	1873	34.8
19........	30 26	44.57	37.41	5.0	1838	76.0	1859	35 0
	27.79	42.36	35.07	— 3.2	....	69.5	....	34.6
20........	31.83	45.80	38.81	— 3.5	1870	68.5	1850	35.5
21........	30.33	45.27	37.80	— 4.5	1838	68.0	1836	36.0
22........	31.82	46.97	39.39	1.5	1858	68.5	1861	36 5
23........	30.11	44.71	87.41	0.0	1858	69.5	1851	37.0
24........	29.38	45.91	37.64	6.0	1873	69.0	1880	37.5
	30.69	45.73	38.21	— 0.1	....	68.7	....	36.5
25........	31.02	46.05	38.53	7.0	1855	67 0	1876	38.0
26........	31.68	48.91	40 29	2.0	1846	68.5	1880	38.5
27	30.58	45.46	38.02	5.0	1836	73.5	1876	38.7
28........	30.47	47.02	38.74	10 5	1836, 1869	74.0	1861	39.0
Mar. 1........	32.35	49.02	40.68	10.0	1843	79.5	1861	39.2
	31.22	47.29	39.25	6.9	....	72.5	....	38.7
2........	31.36	45.97	38.66	8.0	1843	76.0	1861	39.8
3........	29.29	43.89	36.59	0.0	1848	78.0	1842	40.0
4........	29.50	44.54	37.02	6.0	1875	75.5	1882	40.5
5........	30.62	47.38	39.00	8.0	1848	71.0	1855	40.8
6........	34.94	49.20	42.07	4.5	1869	76.5	1860	41.0
	31.14	46.19	38.67	5.3	....	75.4	....	40.4

TEMPERATURES IN ST. LOUIS—Continued.

1836-1882.	Mean value for each day.			Extreme maxima and minima observed for each day of the year.				Supposed true mean......
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
7........	34.88	51 60	43.24	10.5	1857	77.0	1853, 1879	41.2
8........	34.49	50 31	42.40	13.5	1875	77.0	1879	41.4
9........	35.01	48.18	41.59	6 0	1877	78.5	1842	41.6
10	33.22	49.52	41.37	10.0	1856	79.5	1879	41.8
11........	34.55	49.67	42.11	7.0	1836	69.0	1848	42.0
	34.43	49.85	42.14	7.4	....	76.0	....	41.6
12........	34 82	50.86	42 84	11.5	1836, 1857	71.0	1839, 1861	42.2
13........	34 24	50.64	42.44	5.0	1867	75.0	1850	42.4
14........	34.51	50.55	42.53	1.0	1867	76.5	1875	42.5
15........	33.87	48.89	41.38	7.5	1870	80 5	1854	42.6
16........	34.14	50.03	42 08	9.0	1843	77.5	1868	42.8
	34.31	50.19	42.25	6.8	....	76.1	....	42.5
17........	33.49	52.07	42.78	10 5	1879	79.0	1842	43.0
18........	34.86	52.32	43.59	15.0	1879	84.0	1842	43.5
19..... ..	36.09	54.82	45.45	18.5	1875	84.0	1842	44.0
20........	36.91	52.52	44 71	14.0	1855	84.0	1842	44.5
21........	34.21	50.68	42.44	7.0	1876	76.0	1878	44.8
	35.11	52.48	43.79	13.0	....	81.4	....	43.9
22........	35.56	54.04	44.80	13.0	1843	76.0	1857	45.0
23........	37.09	55.48	46.28	7.5	1843	82.5	1868	45.2
24........	36.90	54 30	45.60	12.0	1843	83.0	1842	45.4
25........	37.21	53.76	45.48	13.0	1843	82.5	1852	45.6
26........	37.69	54.92	46 30	13.5	1873	78.5	1838	46.0
	36.89	54.50	45.69	11.8	....	80.5	....	45.4
27........	39.16	56.81	47.98	23.5	1850	85.0	1838	46.5
28........	39.77	57.31	48.54	18.0	1855	83.5	1879	47.0
29........	40.42	58.31	49.36	23.5	1876	86.0	1842	47.5
30........	41.07	57.91	49.49	28 0	1876	84.0	1838	48.0
31..... ..	40.35	57.34	48.84	25 5	1856	84.0	1838	48.5
	40.15	57.53	48.84	23.7	....	84.5	....	47.5
Apr. 1..... ..	39.70	57.25	48.47	24.0	1881	81.5	1882	49.5
2........	40.92	61.12	51.02	24.0	1881	85.0	1882	50.0
3........	44.66	62.44	53.55	24.5	1879	86.0	1882	51.0
4........	44.00	59.67	51.83	23.0	1879	85 0	1882	51.5
5........	42.79	60.82	51.80	22.5	1857	88.5	1871	52.0
	42.41	60.26	51.33	23.6	....	85.2	....	50.8
6........	43 61	62.89	53.25	18.0	1857	89.0	1871	52.5
7........	44.77	63.98	54.37	29.0	1880	85.5	1860	53.0
8........	45.59	60.96	53.28	24.0	1845	82.5	1836	53.0
9........	43.84	61.86	52.85	27.0	1857	84.0	1844	53.2
10........	45.07	61.94	53.50	28.5	1836, 1874	87.0	1844	53.4
	44.57	62.33	53.45	25.3	....	85.6	....	53.0

TEMPERATURES IN ST. LOUIS—Continued.

1834–1882.	Mean value for each day.			Extreme maxima and minima observed for each day of the year.				Supposed true mean........
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
11........	43.81	62.53	53.17	27.0	1857	83.0	1842	53 6
12........	45.35	62.44	53.89	26.0	1857	84.0	1856	53.8
13........	45.33	63 59	54.46	32.0	1857	88.0	1845	54.0
14........	45.03	63.26	54.14	28.5	1857	84.0	1845	54.2
15........	44.52	62.02	53.27	23.0	1850	82.0	1856	54.4
	44.81	62.77	53.79	27.3	....	84.2	....	54.0
16........	45.62	62.26	53.94	26.5	1875	91.0	1845	54.6
17........	45.11	64.55	54.83	20.5	1875	93.0	1855	55.0
18........	45.78	64.34	55.06	26.0	1875	99.0	1855	56.0
19........	47.20	66.47	56.83	29.0	1857	83.0	1847	57.0
20........	48.47	67.92	58.19	34.0	1857	85.0	1836	58.0
	46.43	65.11	55.77	27.2	....	90.2	....	56.1
21........	49.76	69.01	59.38	36.0	1857, 1875	85.0	1867	59.0
22........	51.37	69.70	60.53	31.5	1875	87.5	1842	60.0
23........	49.88	69.90	59.89	31.5	1865	97.0	1842, 1854	60.0
24........	50.24	68.92	59.58	34.0	1874	88.5	1854	60.0
25........	51.89	70.82	61.35	33.5	1874, 1875	93.0	1843, 1855	60.0
	50.63	69.67	60.15	33.3	....	88.2	....	59.8
26........	51.20	70.53	60.86	33.5	1873	88.0	1872	60.0
27........	50.63	69.98	60.30	37.0	1857	93.0	1838	60.0
28........	51.21	68.71	59.96	34.0	1854	83.5	1845	60.0
29........	50 87	69.15	60.01	33.0	1874	89.5	1845	60.0
30........	50.68	69.07	59.87	32.0	1877	92.5	1855	60.0
	50.92	69.49	60.20	33.9	....	89.3	....	60.0
May 1........	50.53	69.72	60.12	35.5	1877	91.5	1836	60.0
2........	51.06	68.34	59.70	29.0	1851	87.0	1836	60.2
3........	51.05	69.67	60.36	38.0	1841	88.5	1849	60 4
4........	53.60	71.04	62.32	37.0	1877	89.0	1860	61.0
5........	53.72	71.88	62.80	37.0	1851	91.5	1860	61.4
	51.99	70.13	61.06	35.3	....	89.5	....	60.6
6........	52.85	71.47	62.16	37.5	1763	88.0	1872	61.8
7........	53.77	73.49	63.63	35.0	1867	88.0	1872	62.0
8........	54.05	72.56	63.30	38.0	1855	88 0	1872	62.5
9........	54.40	73.21	63.80	39.0	1855	88.0	1872	63.0
10........	53.37	73.16	63.26	40.0	1838, 1871	89.5	1844, 1863	63.5
	53.68	72.78	63.23	37.9	....	88.3	....	62.5
11........	54.12	72.78	63.45	39 0	1864	91.5	1844	64.0
12........	55.17	74.79	64.98	39 5	1857	91.5	1836	64.5
13........	56.34	75.17	65.75	41.5	1878	90.0	1862	65.0
14........	56.72	74.75	65.73	42.0	1878	97.5	1836	65.5
15........	55.61	75.53	65.57	40.5	1878	93.0	1836	66.0
	55.59	74.60	65.05	40.5	....	92.7	....	65.0

TEMPERATURES IN ST. LOUIS—Continued.

1836–1882.	Mean value for each day.			Extreme maxima and minima observed on each day of the year.				Supposed true mean......
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
May 16........	56.73	75.52	66.12	40.0	1837, 1875	92.0	1851	66.5
17........	56.01	73.47	64.74	42.0	1857	91.0	1853	67.0
18........	55.19	75.27	65.23	42.0	1857	87.0	1836, 1870	67.5
19........	57.24	77.30	67.27	43.0	1853	89.5	1871	68.0
20........	57.61	77.34	67.47	42.0	1852	90.5	1836	68.2
	56.55	75.78	66.17	41.8	....	90.0	....	67.4
21........	58.76	76.31	67.63	43.0	1857	96.0	1870	68.4
22........	58.53	78.02	68.27	40.0	1838	97.0	1870	68.6
23........	59.26	77.68	68.47	44.0	1867, 1876	90.0	1839, 1856	68.8
24........	69.66	78.80	69.23	45.0	1851	92.5	1873, 1879	69.0
25........	60.21	77.40	68.80	44.0	1845	93.0	1860	69.5
	59.28	77.64	68.46	43.2	....	93.7	....	68.8
26........	60.46	81.00	70.73	48.0	1853	93.0	1860	70.0
27........	60.33	79.37	69.85	48.0	1854	94.0	1874	70.2
28........	60.46	80.59	70.52	45.0	1838	91.0	1848, 1851	70.4
29........	61.08	79.24	70.16	44.0	1866	91.0	1852, 1879	70.6
30........	61.68	79.94	70.81	44.0	1845	90.0	1841, 1854	70.8
	60.80	80.02	70.41	45.8	....	91.8	....	70.4
31........	62.14	79.25	70.69	52.0	1856	97.0	1871	71.0
June 1........	61.49	79.78	70.63	49.0	1843	91.0	1846, 1852	71.0
2........	62.39	80.70	71.54	49.0	1838	94.0	1862	71.2
3........	62.44	80.12	71.28	47.5	1879	93.0	1856	71.4
4........	62.05	79.06	70.56	44.0	1869	94.0	1841	71.6
	62.10	79.78	70.94	49.3	....	93.8	....	71.2
5........	61.36	79.45	70.40	43.0	1830	93.0	1871	71.8
6........	62.57	81.88	72.22	43.0	1838	93.0	1836, 1874	72.0
7........	62.18	81.34	71.73	50.0	1864	95.0	1874	72.2
8........	63.83	81.95	72.89	49.0	1864	96.0	1836	72.4
9........	63.62	81.18	72.40	51.5	1852, 1877	99.5	1836	72.6
	62.71	81.16	71.93	47.3	....	95.3	....	72.2
10........	62.65	81.90	72.27	46.5	1877	97.5	1836	72.8
11........	61.90	79.38	70.64	45.0	1842	94.0	184	73.0
12........	63.32	81.59	72.45	50.0	1858	94.5	1853	73.2
13........	64.87	83.82	74.34	50.0	1858	94.5	1853	73.4
14........	65.01	83.84	74.42	51.0	1856	96.0	1879	73.6
	63.55	82.10	72.82	48.5	....	95.3	....	73.2
15........	65.11	83.79	74.45	49.0	1869	96.5	1868	73.8
16........	65.26	82.32	73.79	53.0	1841	98.5	1868	74.0
17........	65.56	82.60	74.08	51.5	1876	98.5	1868	74.3
18........	65.78	83.97	74.87	49.5	1876	99.0	1868	74.6
19........	65.59	84.37	74.98	52.0	1866	96.0	1853, 1869	74.8
	65.46	83.41	74.43	51.0	....	97.7	....	74.3

TEMPERATURES IN ST. LOUIS—Continued.

1836–1882.	Mean value for each day.			Extreme maxima and minima observed on each day of the year.				Supposed true mean......
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
June 20........	65.92	83.96	74.94	52.0	1862	98.0	1861	75.0
21........	65.57	83.52	74.54	49.0	1863	97.0	1853	75.3
22........	65.64	85.82	75.73	50.0	1868	99.0	1871	75.6
23........	67.06	84.58	75.82	53.0	1868	101.5	1871	76.0
24........	66.91	85.11	76.01	55.5	1853	97.5	1870	76.5
	66.22	84.60	75.41	51.9	....	98.6		75.7
25........	68.13	86.54	77.33	56.0	1852	98.0	1870, 1882	77.0
26........	68.73	87.88	78.30	55 0	1865	98.5	1870	77.5
27........	70.26	87.21	78.73	59.0	1836	97.0	1854	78.0
28........	69.36	87.48	78.42	55.5	1866	100.0	1870	78.0
29........	69.26	86 08	77.67	51.0	1866	101.5	1870	78 0
	69.15	87.04	78.09	55.3	....	99 0	....	77.7
30........	69.23	86.95	78.09	56 0	1871	101.5	1870	78.0
July 1........	68.39	85.91	77.15	54.0	1851	98.0	1854	78 0
2	68.06	85.60	76.83	54.0	1861	98.5	1858	78.0
3........	68 42	87.10	77.76	56.0	1857	99.5	1856	78 1
4........	68.71	87.89	78.30	53.0	1859	100.5	1868	78.2
	68.56	86.69	77.62	54.6	....	99.6	....	78.1
5........	69.24	87.39	78.32	56.5	1882	98.5	1870	78.3
6........	70.11	88.05	79 08	54 0	1842	97.0	1868	78 6
7........	70 20	87.84	79 02	58.0	1842	98 0	1874	79.0
8........	70.55	87.97	79.26	58.0	1870	97.0	1854, 1879	79.0
9........	71 05	89.15	80.10	57.0	1842	99.0	1858	79.2
	70.23	88.08	79.15	56.7	....	97.9	....	78.8
10........	71.46	87.84	79.65	61.0	1836	101 5	1881	79.2
11........	70.35	86.99	78 67	58.0	1854, 1873	100.0	1841	79.4
12........	70 64	87.50	79 07	58 0	1863	100 0	1841	79.4
13........	69.99	88.61	79.30	57.0	1861	100 5	1862	79.6
14........	70.69	88 66	79.67	56.5	1882	100.5	1868	79 6
	70.62	87.92	79.27	58.1	....	100.5	....	79.4
15........	71 44	89.38	80.41	58.0	1842	100.0	1856	80 0
16........	71.42	89.02	80.22	55.0	1863	100 0	1870	80 0
17........	70 66	90 07	80.36	56.0	1863	102.5	1856	80 0
18.... ...	70.77	88.73	79 75	58.0	1846	101 5	1868	79.6
19........	70.44	87.70	79.07	58.0	1878	100.0	1854	79.4
	70.94	88.98	79.96	57.0	....	100.8	....	79.8
20........	69.94	86.92	78 43	57.0	1873	100 5	1854, 1860	79.2
21........	69.08	86.42	77.13	57.0	1869	104.0	1860	79.0
22........	68.63	85 63	77.94	57.0	1864	101.5	1870	79.0
23........	68.72	87.16	78.01	55.0	1861	98.5	1870	79.0
24........	69.01	87.86	78.43	56.0	1861	101.0	1870	78 8
	69.07	86.79	77.93	56.4	....	101.1	....	79 0

TEMPERATURES IN ST. LOUIS—Continued.

1836–1882.	Mean value for each day.			Extreme maxima and minima observed on each day of the year.				Supposed true mean.....
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
July 25........	70.24	88.38	79.31	59.0	1876	100.0	1870	78.6
26........	70.73	88.27	79.50	58.0	1853	99.5	1870	78.4
27........	70.38	87.58	78.98	56.0	1853	101.5	1870	78.2
28........	70.23	87.80	79.01	56.0	1853	100.0	1838	78.0
29........	70.58	87.58	79.08	61.0	1853, 1865	101.0	1854	78.0
	70.43	87.92	79.17	58.0	....	100.4	....	78.2
30........	68.52	85.57	77.04	55.0	1847	101.0	1838	77.8
31........	67.96	86.47	77.21	55.0	1849	100.0	1854	77.8
Aug. 1........	68.38	87.33	77.85	52.0	1842	101.0	1854	77.5
2.......	68.25	86.95	77.60	52.0	1842	99.0	1861	77.5
3........	68.61	86.59	77.60	55.0	1842	101.0	1861	77.5
	68.34	86.58	77.46	53.8	....	100.4	....	77.6
4........	68.40	85.51	76.95	54.0	1880	101.5	1861	77.5
5........	68.50	86.01	77.25	58.0	1880	97.5	1858	77.5
6........	68.97	87.18	78.07	58.0	1842	98.5	1838	77.5
7........	69.11	87.07	78.09	57.5	1852	100.0	1861	77.4
8........	68.96	87.09	78.02	56.0	1869	99.0	1850	77.4
	68.79	86.57	77.68	56.7	....	99.3	....	77.4
9	68.94	85.14	77.04	58.0	1879	104.0	1881	77.4
10........	69.07	83.39	76.23	55.5	1882	98.0	1881	77.4
11........	69.37	86.44	77.90	57.0	1882	100.5	1881	77.4
12........	68.38	86.47	77.42	56.0	1868	105.0	1881	77.2
13........	68.72	86.08	77.40	57.0	1860	101.5	1850	77.0
	68.89	85.50	77.19	56.7	. ...	101.8	....	77.3
14........	68.49	85.30	76.89	56.5	1861	98.5	1857	77.0
15	68.52	85.39	76.95	59.5	1861	97.0	1841	76.9
16........	67.48	86.22	76.89	57.0	1866	96.0	1860	76.8
17........	67.94	85.54	76.74	54.0	1855	97.0	1843, 1860	76.7
18........	68.03	86.27	77.15	56.0	1855, 1866	99.5	1850	76.5
	68.09	85.74	76.91	56.6	....	97.6		76.8
19...	68.19	85.25	76.72	56.0	1855	99.5	1850	76.4
20........	66.88	85.72	76.30	52.0	1836	99.0	1850	76.3
21........	67.87	85.71	76.79	59.0	1864	97.0	1869	76.2
22........	67.29	84.67	75.98	51.0	1837	97.5	1872	76.0
23........	66.31	84.09	75.20	52.0	1866	97.5	1869	76.0
	67.31	85.09	76.20	54.0	....	98.1	....	76.2
24........	66.63	85.29	75.96	49.0	1866	97.0	1872	75.8
25	66.38	84.42	75.40	50.5	1866	100.0	1872	75.5
26........	67.02	84.94	75.98	49.0	1863	98.5	1872	75.3
27........	65.88	84.11	74.99	54.0	1856	97.5	1838	75.0
28........	65.37	82.98	74.17	51.0	1844	97.5	1881	74.8
	66.25	84.35	75.30	50.7	....	98.1	....	75.3

TEMPERATURES IN ST. LOUIS—Continued.

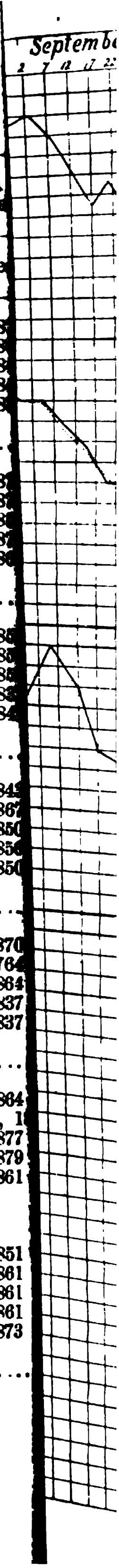
1836-1882.	Mean value for each day.			Extreme maxima and minima observed on each day of the year.				Supposed true mean.......
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Aug. 29........	64.80	83.05	73.92	49.0	1863	99.5	1881	74.5
30........	64.55	84.34	74.44	45.0	1863	100.5	1854	74.3
31........	65.45	82.96	74.20	48.5	1863	99.0	1854, 1873	74.2
Sept. 1........	64.75	83.69	74.22	50.0	1849	98.5	1854	74.0
2........	65.08	82.80	73.94	51.5	1850	102.0	1864	74.0
	64.93	83.37	74.15	48.8	....	99.9	....	74.2
3........	64.54	83.00	73.77	51.0	1863	102.0	1864	74.0
4........	65.10	83.59	74.34	51.0	1868	100.0	1881	74.0
5........	65.33	82.15	73.74	50.0	1859	100.0	1881	73.8
6........	64.98	81.84	74.41	51.5	1848	97.0	1881	73.6
7........	65.61	83.17	74.39	52.0	1849	97.0	1881	73.4
	65.11	82.75	73.93	51.1		99.2		73.7
8........	64.48	83.47	73.97	49.5	1849	99.5	1854	73.0
9........	63.79	80.63	72.21	50.0	1847, 1869	93.5	1841	72.0
10........	62.59	79.95	71.27	46.5	1880	96.5	1842	71.0
11........	61.01	78.90	69.95	47.5	1878	94.0	1842	70.2
12........	60.69	77.79	69.24	46.0	1839, 1878	92.0	1865	70.0
	62.51	80.15	71.33	47.9	....	95.1	....	71.2
13........	60.27	77.85	69.06	47.0	1839, 1878	93.0	1851, 1864	70.0
14........	60.37	79.16	69.76	43.5	1873	93.0	1846	69.5
15........	60.51	77.88	69.19	47.5	1880	88.0	1849. 1862	69.0
16........	60.76	79.34	70.05	47.0	1842	91.5	1857	69.0
17........	60.54	77.72	69.13	40.5	1868	93.0	1843, 1857	68.5
	60.49	78.39	69.44	45.1	....	91.7	....	69.2
18........	60.08	78.29	69.18	42.0	1863	92.5	1867	68.0
19........	57.74	75.91	66.82	44.5	1863	92.0	1867	67.0
20........	55.76	73.68	64.72	39.0	1875	93.5	1881	66.0
21........	55.50	73.29	64.39	39.5	1866	95.0	1872	66.0
22........	55.39	73.69	64.54	39.0	1875	92.0	1861	65.8
	56.89	74.96	65.93	40.8	....	93.0	....	66.5
23........	58.17	76.82	67.49	36.0	1856	92.0	1881	65.5
24........	58.15	76.23	67.19	37.0	1856	92.5	1881	65.0
25........	57.09	75.37	66.23	42.0	1879	91.5	1850	64.8
26........	54.61	73.81	64.21	40.0	1875	92.0	1847	64.5
7........	54.87	73.82	64.34	41.5	1871	88.0	1854	64.3
	56.58	75.21	65.89	39.3	....	91.2	....	64.8
28........	54.37	73.53	63.95	36.0	1839	90.5	1867	64.0
29........	54.17	71.87	63.02	35.5	1846	93.0	1858	63.5
30........	52.59	71.53	62.06	35.0	1851	90.0	1858	63.0
Oct. 1........	54.64	73.37	64.00	36.5	1856	87.0	1856	63.0
2........	54.68	73.74	64.21	38.5	1856	91.0	1867	63.0
	54.09	72.81	63.45	36.3	....	90.3	....	63.1

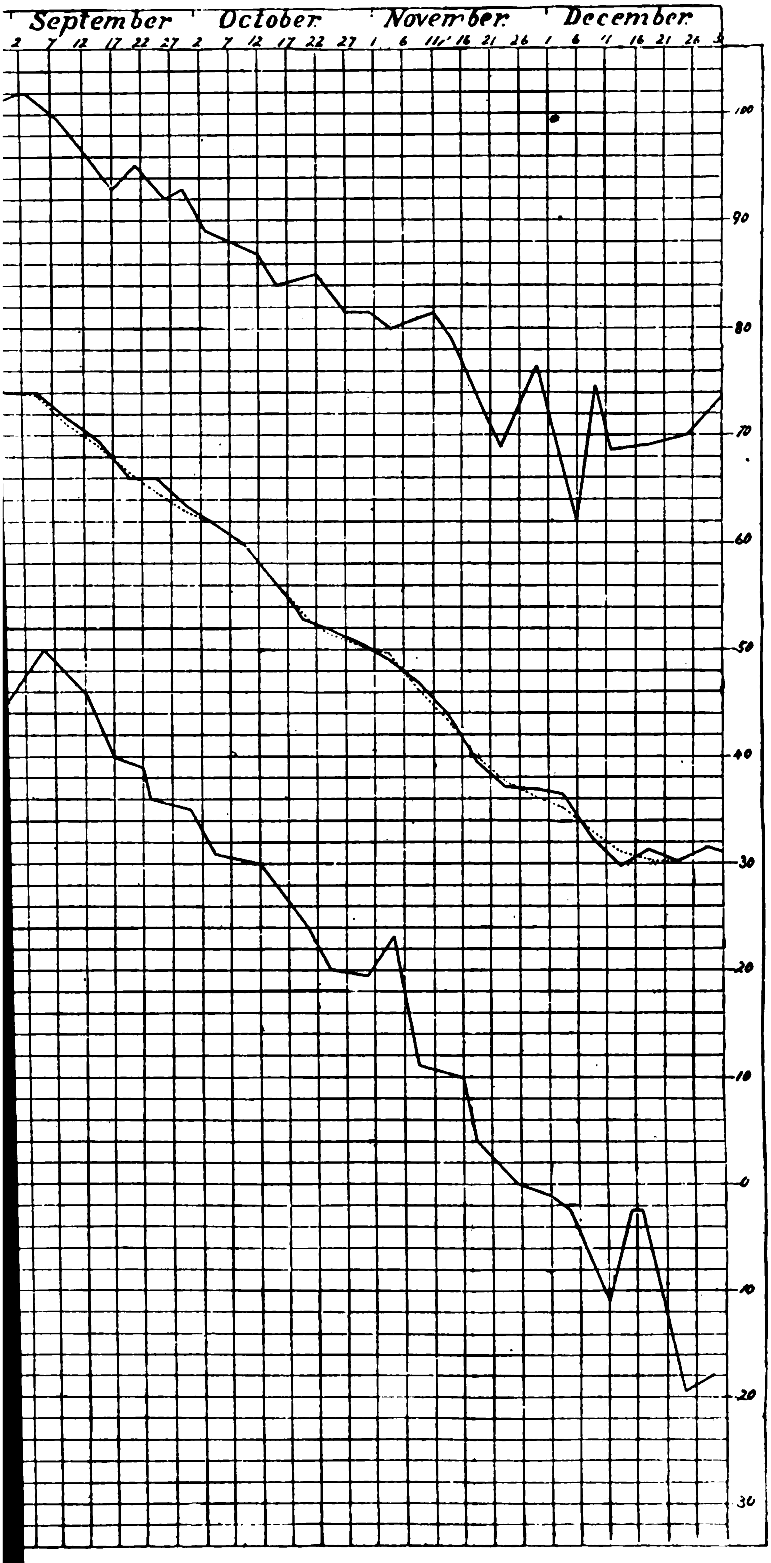
TEMPERATURES IN ST. LOUIS—Continued.

1836-1882.	Mean value for each day.			Extreme maxima and minima observed on each day of the year.				Supposed true mean......
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Oct 3........	54.52	73.55	64.03	33.0	1840	89.0	1872	62.5
4	52.29	70.59	61.44	31.0	1836	88.5	1872	62.0
5........	52.18	70.36	61.27	34.0	1836	88.0	1879	61.5
6........	52.52	70.03	61.27	34.0	1855	88.5	1852	61.5
7........	51.93	70.62	61.27	34.0	1873	87.0	1860	61.0
	52.69	71.03	61.86	33.2	....	88.2	....	61.7
8........	51.70	71.14	61.42	31.5	1868	85.0	1856	60.5
9........	51.49	70.66	61.07	36.5	1842, 1864	87.0	1879	60.0
10........	51.26	69.91	60.58	37.0	1849	86.0	1879	59.5
11........	49.98	67.14	58.56	31.5	1872	86.0	1879	59.0
12........	48.73	64.91	56.82	30.0	1875	87.0	1879	58.5
	50.63	68.75	59.69	33.1	....	86.2	....	59.5
13	45.99	65.96	55.97	29.5	1860	81.5	1879	58.0
14........	47.20	65.24	56.22	29.5	1872	84.0	1878	57.5
15........	46.88	65.82	56.35	28.0	1845	84.5	1881	57.0
16........	47.34	65.64	56.49	27.0	1838	83.0	1842	56.0
17........	46.80	65.42	56.11	31.0	1836, 1868	83.0	1839, 1842	55.0
	46.84	65.61	56.23	29.0	....	83.2	....	56.7
18........	44.64	60.55	52.59	34.5	1875	82.5	1867	54.5
19........	42.70	61.62	52.16	30.0	1846	84.0	1837	54.0
20........	42.75	62.31	52.53	24.0	1836	83.0	1843	53.5
21........	44.60	62.47	53.53	25.0	1836	84.0	1837	53.0
22........	44.15	61.47	52.81	30.0	1869	85.0	1837	52.5
	43.77	61.68	52.72	28.7	....	83.7	....	53.5
23........	43.41	61.54	52.47	20.0	1863	79.5	1839	52.0
24........	44.32	60.64	52.48	20.0	1863	78.0	1875	51.8
25........	42.51	59.96	51.23	22.0	1841	78.5	1882	51.6
26........	43.64	60.56	52.10	21.5	1862	81.5	1874	51.4
27........	42.15	61.11	51.63	26.0	1869	81.5	1870	51.0
	43.20	60.76	51.98	21.9	....	79.8	....	51.5
28........	43.54	60.56	52.05	27.0	1873, 1878	80.5	1874	51.0
29........	43.71	60.77	52.24	22.0	1873	81.5	1875	50.5
30........	42.34	57.28	49.81	26.5	1863	81.5	1876	50.5
31........	39.75	56.66	48.20	19.5	1863	80.0	1876	50.0
Nov. 1........	42.01	59.97	50.99	22.0	1873	78.0	1842, 1876	50.0
	42.27	59.05	50.66	23.4	....	80.5	....	50.4
2........	43.20	58.00	50.60	30.5	1848	77.0	1847	50.0
3	41.11	56.59	48.85	25.5	1879	75.5	1859	49.8
4........	42.01	58.66	50.33	23.0	1879	80.0	1850	49.4
5........	41.23	55.70	48.46	25.0	1865	72.5	1874	49.0
6........	38.91	55.29	47.10	23.5	1877	73.0	1874, 1878	48.5
	41.29	56.85	49.07	25.5	....	75.6	....	49.3

TEMPERATURES IN ST. LOUIS—Continued.

1836–1882	Mean values for each day.			Extreme maxima and minima served on each day of the ye			
	Min.	Max.	Mean.	Min.	Year.	Max.	Ye
Nov. 7........	40.78	57.55	49.16	24.0	1856	77.0	18
8........	40.30	55.78	48.04	11 0	1838	75.5	18
9........	37 43	51.88	44.66	16.0	1838	75.0	18
10........	39 03	52.71	45.87	20.0	1838	76.0	18
11........	40.23	53 53	46 88	26.5	1869	81.5	18
	39.55	54.29	46.92	19.5	....	77.0	......
12........	36.93	51.66	44 29	17.0	1859	71.5	18
13........	36.66	52 82	44.74	15.0	1859	79.0	18
14........	36.67	51.86	44.26	20.0	1872	71.5	18
15........	35.18	50.01	42.59	18.0	1838	72.0	18
16........	36.11	49.60	42.85	10.0	1838	69.0	18
	36.31	51.19	43.75	16.0	....	72.6	......
17	35.55	47.80	41 67	12.0	1838	69.0	18
18........	33.62	45.58	39.60	6.0	1880	72.0	18
19........	31.60	45.03	38.31	7.5	1880	71.0	18
20........	32.59	45.11	38.85	9 5	1872	72.5	18
21........	33.09	45.84	39.46	10.5	1880	69.0	18
	33.29	45.87	39.58	9.1	....	70.7	......
22........	32.28	45.92	39.10	6.5	1880	71.0	184
23........	32.14	43.97	38.05	9.5	1871	69.0	186
24........	29 85	41 93	35.89	5 5	1860	65 5	185
25........	29 83	41.92	35 87	0.0	1839	64.5	185
26........	31.25	44.06	37.65	14.0	1839	65.0	185
	31.07	43.56	37.31	7.1	....	67.0	......
27........	31.44	43.22	37.33	5 0	1845	67 0	1870
28........	31.64	44 05	37.84	— 0.5	1845	72 0	1764
29........	29 04	42.76	85.90	2.0	1872	76 5	1864
30........	28.55	42.98	35.76	6.5	1845	72.5	1837
Dec. 1........	30.33	45.57	37.95	— 1.0	1845	72.5	1837
	30.20	43.71	36.95	2.4	....	72.1	....
2........	31.06	44.95	38.00	4.0	1876	72.0	1864
3........	30.61	43 00	36.80	8 0	1859	61 0	1842, 1
4........	30.75	42.18	36.46	— 2.5	1871	59.0	1877
5........	29.45	41 33	35.39	2.5	1871	61.0	1879
6........	29.56	41.88	35.72	3.5	1859	62 0	1861
	30.28	42.67	36.47	3.1	....	63.0	
7........	28 00	40.23	34.11	—11.0	1882	63.0	1851
8........	27.79	39.11	33.49	— 4 0	1882	65.0	1861
9........	25 07	35 35	30 21	— 5.0	1876	74 5	1861
10........	23.89	36 06	29 97	0 0	1868	68.0	1861
11........	28.19	37.61	32 90	—11.0	1868	68.0	1873
	26.59	37.67	32.13	— 6.2	....	67.7	....




September
October
November
December
2
7
12
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27
2
7
12
17
22
27
1
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11
16
21
26
1
6
11
16
21
26
31
100
90
80
70
60
50
40
30
20
10
0
10
20
30

TEMPERATURES IN ST. LOUIS—Continued.

1836–1882.	Mean value for each day.			Extreme maxima and minima observed on each day of the year.				Supposed true mean.......
	Min.	Max.	Mean.	Min.	Year.	Max.	Year.	
Dec. 12.......	25.54	37.15	31.34	— 0.5	1868	68.5	1877	31.8
13........	26.25	36.70	31.47	4.0	1865	62 5	1881	31.6
14........	23.46	33.79	28 62	— 1 0	1865	59.0	1861	31.4
15........	23.57	33.46	28.51	— 2.5	1851	67.5	1877	31.2
16........	24.29	34.83	29.56	— 0.5	1851	62 0	1877	31.0
	24.62	35.18	29.90	— 0.1	....	63.9	....	31.4
17........	25.10	36.91	31.00	— 2.5	1875	67.0	1877	31.0
18........	25.76	38.87	32.31	1.0	1876	69 0	1877	30.8
19........	26.37	38.10	32.23	0.5	1863	67.5	1877	30.6
20........	23.51	35.84	29 67	— 2.0	1871	65.0	1877	30.4
21.......	24.84	36 97	30.90	— 2.0	1865	66.0	1877	30.0
	25.11	37.34	31.22	— 1.0	....	66.9	....	30.5
22........	22.64	33.86	28.25	—14.0	1872	62.0	1877	30.0
23........	22.51	35.34	28.92	— 7.0	1870	61.0	1875	30.2
24........	23.90	36.62	30.26	—19.5	1872	66.0	1875	30.5
25........	25 42	37 95	31.68	—11.0	1872	70.0	1867	31.0
26........	25.63	38.06	31.84	— 5.0	1872	65.0	1875	31.2
	24.02	36.86	30.19	—11.3	....	64.8	....	30.6
27........	26.47	38.41	32.44	— 6.0	1872	65.0	1846	31.3
28........	26.34	37.80	32 07	— 6.0	1880	59.0	1862	31.5
29........	25.83	37.49	31.66	—18.0	1880	64.0	1851	31.5
30........	23 26	36.73	29.99	— 8.0	1880	66.0	1875	31.5
31.......	24.25	38.43	31.34	—10.5	1863	73.5	1875	31.5
	25.23	37.77	31.50	— 9.7	....	65.5	....	31.5

The annexed diagram, for the construction of which I am indebted to Dr. G. Hambach, represents the principal results of these tables. The perpendicular lines divide the year into 73 periods of 5 days each, while the horizontal ones mark the degrees. The central full-faced curve indicates the mean temperature of the penthemeral periods of the 47 years, as actually found, while the dotted line represents the supposed real mean temperature as suggested in the last column of these tables. The uppermost curve shows the highest temperatures and the lowest curve the lowest temperatures observed in those same penthemeral periods within the same number of years. It will be noticed that while the points of mean temperaturs occupy the center of each period, the maxima and minima do not show in the middle of the spaces, but on that one of the 5 days of the period on which they actually did occur.

TEMPERATURES.

The following notes are taken mostly from "American Weather," by Gen. A. W. Greely:

THE HIGHEST OBSERVED TEMPERATURE.

The highest observed temperatures of the world occur over the desert of Sahara, the plains of India, in the interior of Australia, and in the valleys of the Gila and Colorado rivers in America. With regard to the temperature over the Sahara we have no definite information, but we have reliable data from the other places. Statements regarding extreme temperatures must be received with caution, not only on account of the errors of thermometers, but also on account of unsuitable exposure. Thermometers that are fairly accurate for ordinary temperatures sometimes vary as much as five to ten degrees for temperatures below zero or above 100. There is sometimes as much as 50 to 100 degrees difference between the readings of a shade and a sun thermometer. For the past twenty years the different weather services of the world have been paying attention to these points, and consequently their thermometer readings can be received with a greater degree of credibility than previous records. On July 17th, 1879, at Aumale, Algeria, a maximum temperature of 125.6 was registered, and on August 27th, 1884, at Ouargla, Algeria, on the northern edge of the African desert, the thermometer rose to 127.4 degrees. These are probably the highest temperatures ever observed by a trained observer from a reliable, well-exposed thermometer. The highest observed by the Indian weather service was 125.0 in June, 1875. The highest observed by the United States signal service was 119 degrees, at Fort McDowell and Phœnix, Arizona, June, 1883, and 118 at Yuma, Arizona, July, 1878. Maximum temperatures of 120 degrees and over reported from other sources in the United States are as follows: Mammoth Tank, Cal., 128, July, 1887; Humboldt, Cal., 122, July, 1887; Fort Miller, Cal., 121, June, 1853; Fort Boise, Idaho, 121, August, 1871; Fort McRae, N. M., 120, June, 1873.

MEAN TEMPERATURE OF THE GLOBE.

The mean annual temperature of the globe is ——.

The highest mean annual temperature of any place is 84 degrees at Massowah, on the shores of the Red Sea. The lowest mean annual temperature is 5 degrees below zero at Fort Conger, Lady Franklin Bay. The highest mean annual temperature of the surface of the sea is 75 degrees, just north of the equator, along the Gold coast, and the lowest is 28 degrees, in the great frozen sea to the northward of Grinnell Land.

THE LOWEST OBSERVED TEMPERATURE.

The lowest temperature ever observed was 90.4 degrees below zero at Werchojansk, Siberia, on January 15th, 1885. The mean temperature for this station for January, 1885, was 63.9 degrees below zero. The lowest observed at Fort Conger was 66.2 below zero. The lowest observed in the United States was 63.1 below zero at Poplar River, Mont., January, 1885.

RANGE OF TEMPERATURE.

The absolute range of temperature for the globe is 217.8 degrees. The absolute range for the United States is 182 degrees. The greatest range for any single station is 181.4 at Yakutsk, Siberia. The greatest range for a single station in the United States is 172.7 at Poplar River, Mont. The greatest monthly range for any station in the United States was 117 degrees, December, 1880. at Fort Benton, Mont. The least monthly range for a single station was 7.0 for October, 1878. at Paramaribo, South America.

NORMAL TEMPERATURE AND RAINFALL IN THE UNITED STATES.

Table showing the normal temperature for January and July, and the normal annual precipitation at Signal Service stations in each of the States and Territories, also the highest and lowest temperatures ever reported from each of said stations, to include 1889.

(Prepared in the office of the Chief Signal Officer, War Department, for the World almanac for 1891.)

States and territories	Stations.	Temperature. Mean. January	Temperature. Mean. July	Temperature. Extr. Highest	Temperature. Extr. Lowest	Mean annual precipitation—rain and melted snow (inches)	States and territories	Stations.	Temperature. Mean. January	Temperature. Mean. July	Temperature. Extr. Highest	Temperature. Extr. Lowest	Mean annual precipitation—rain and melted snow (inches)
Ala.	Mobile	50	82	101	11	64.1	Mont.	Poplar River	—5	69	110	—63	10.8
	Montgomery	48	84	107	5	53.3	N. C.	Charlotte	41	79	102	—5	54.8
Ariz.	Grant, Fort	43	78	103	7	16.5		Hatteras	44	78	92	8	69.8
	Prescott	32	73	103	—18	16.4		Wilmington	47	80	103	9	57.5
Ark.	Yuma	54	92	118	22	3.1	Neb.	North Platte	19	74	107	—35	20.2
	Fort Smith	34	80	104	—7	42.4		Omaha	19	76	105	—32	33.5
	Little Rock	40	81	102	—5	53.5		Valentine	14	74	106	—35	17.2
Cal.	Red Bluff	46	82	112	18	25.7	Nevada	Winnemucca	28	72	104	—28	8.6
	Sacramento	46	72	108	19	21.9	N. Dak.	Bismarck	4	67	105	—44	19.0
	San Deigo	54	67	101	32	11.2		Buford, Fort	3	68	107	—49	13.8
Colo.	Denver	27	72	105	—29	14.6	N. H.	Manchester	22	69	96	—11	41.9
	Las Animas	22	76	105	—26	13.5	N. J.	Atlantic City	32	72	99	—7	42.5
	Montrose	23	72	98	—20	8.9		Cape May	34	74	91	1	47.2
Conn.	New Haven	27	72	100	—14	50.3		New Brunswick	28	74	98	—12	46.8
	New London	28	71	93	—10	49.1	N. Mex.	Santa Fe	28	68	97	—13	13.5
Del.	Del. Breakwater	33	73	98	1	32.6		Stanton, Fort	34	68	95	—18	17.3
Dist Col.	Washington	33	77	104	—14	44.8	N. Y.	Albany	23	73	97	—18	38.2
Florida	Jacksonville	55	82	104	15	58.8		New York City	30	74	100	—6	45.1
	Key West	70	84	100	41	39.9		Oswego	25	69	100	—23	35.0
	Pensacola*	52	81	99	15	63.6	Ohio	Cincinnati	33	78	104	—12	41.0
Georgia	Atlanta	43	78	100	—2	55.9		Columbus	28	75	103	—20	39.3
	Augusta	47	82	105	6	48.6		Toledo	26	74	99	—16	31.8
	Savannah	51	82	105	12	52.3	Oregon	Portland	39	67	99	—2	49.8
Idaho	Boise City	28	73	107	—28	13.2		Roseburg	40	66	101	—6	34.3
Illinois	Cairo	34	79	103	—16	43.6		Umatilla	32	78	78	—24	9.7
	Chicago	24	72	100	—23	36.2	Pa.	Erie	27	72	94	—16	42.1
	Springfield	25	77	102	—22	40.7		Philadelphia	32	76	100	—5	41.2
Indiana	Indianapolis	28	76	101	—25	44.4		Pittsburgh	30	74	103	—12	37.6
Ind. Ter.	Sill, Fort	35	82	107	—9	31.2	R. I.	Block Island	30	69	88	—4	46.5
Iowa	Des Moines	17	75	104	—30	36.4		Newport	30	70	92	—8	50.0
	Dubuque	17	75	101	—32	37.3	S. C.	Charleston	49	82	104	10	57.3
	Keokuk	23	77	102	—24	36.5	S. Dak.	Yankton	13	74	103	—34	27.3
Kansas	Dodge City	25	78	108	—20	20.8	Tenn.	Chattanooga	41	78	101	—7	56.5
	Concordia	19	77	103	—25	27.8		Memphis	40	81	102	—8	53.3
	Leavenworth	24	78	107	—29	38.7		Nashville	38	80	104	—10	51.4
Ky.	Louisville	34	79	105	—20	46.9	Texas	Elliott, Fort	30	77	108	—14	24.5
La.	New Orleans	54	83	97	13	64.0		Brownsville	57	84	102	18	36.9
	Shreveport	45	83	107	1	52.2		El Paso	44	82	113	—5	10.0
Maine	Eastport	20	60	88	—21	50.1		Palestine	43	82	102	0	45.4
	Portland	23	69	97	—17	42.1	Utah	Frisco	30	73	93	0	7.6
Md.	Baltimore	34	78	102	—6	44.2		Salt Lake	28	76	101	—20	16.8
Mass.	Boston	26	71	101	—13	46.4	Vt.	Burlington	19	71	97	—24	28.8
	Springfield	26	73	94	—14	47.0	Va.	Lynchburg	36	78	102	—5	44.5
Mich.	Grand Haven	24	69	92	—24	37.9		Norfolk	40	79	102	6	52.4
	Marquette	16	65	100	—27	32.6	Wash.	Dayton	30	68	109	—26	27.8
	Port Huron	21	69	99	—25	32.1		Olympia	38	62	97	—2	53.1
Minn.	Duluth	10	66	99	—41	32.5		Tatoosh Island	40	56	75	14	92.4
	St. Paul	11	72	100	—41	27.8	W. Va.	Morgantown	35	74	97	—10	46.9
	St. Vincent	—8	65	103	—54	16.6	Wis.	La Crosse	15	73	101	—43	31.9
Miss.	Vicksburg	47	82	101	3	57.8		Milwaukee	19	69	100	—25	32.8
Mo.	St. Louis	30	79	106	—22	33.4	Wyo.	Bridger, Fort	19	64	89	—42	8.7
	Springfield	32	75	99	—11	48.5		Cheyenne	25	67	100	—38	11.7
Mont.	Assiniboine, Fort	9	67	108	—55	15.4		Washakie, Fort	10	67	100	—54	11.0
	Custer, Fort	14	71	106	—48	13.0							

The minus (—) sign indicates temperature below zero.

TEMPERATURE AND RAINFALL OF FOREIGN CITIES.*

City.	Mean annual temperature........	Mean annual rain fall, inches	City.	Mean annual temperature........	Mean annual rainfall, inches......
Algiers	64.3	27	Madrid	58.2	9
Amsterdam	49.9	....	Manchester	48.8	36
Astrakan	50.1	6	Manilla	78.4	....
Auckland, N. Z	58.4	....	Maranham	....	277
Barcelona	63.0	....	Marseilles	58.3	23
Berlin	48.2	24	Massowah	84.0	....
Birmingham	48.2	....	Melbourne	57.0	29
Bombay	81.3	75	Mexico	60.9	....
Bordeaux	57.0	30	Milan	55.1	38
Brussels	50.7	29	Montreal	44.6	....
Buenos Ayres	62.8	....	Moscow	40 0	....
Cairo	72.2	....	Munich	48.4	....
Calcutta	82.4	76	Naples	60.3	30
Cayenne	....	116	Nice	59.5	....
Cherrapunji	....	493	Palermo	64.4	....
Christiana	41.5	....	Paris	51 3	22
Constantinople	56.5	....	Prague	50.2	14
Copenhagen	46.6	19	Quebec	40 3	....
Dublin	50.1	29	Quito	60.9	....
Edinburgh	47.1	38	Rio Janeiro	77 2	29
Florence	59.2	41	Rome	60.5	31
Fort Conger	—5.0	....	Rotterdam	51.0	23
Geneva	52.7	32	San Domingo	81.3	108
Genoa	61.1	47	St. Petersburg	39.6	17
Gibraltar	64.0	....	Stockholm	42 3	20
Glasgow	49.8	44	Sydney	65.8	49
Halifax	43.2	41	Toronto	44 3	31
Havana	79.1	91	Valparaiso	64.0	....
Jerusalem	62.6	16	Venice	55.4	....
Lima	73.3	....	Vera Cruz	77.0	180
Lisbon	61.4	27	Vienna	51.0	19
London	50.8	25	Warsaw	56.2	....

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*Mostly taken from the World Almanac for 1891.

SUNSHINE MAXIMUM, NIGHT MINIMUM AND SOIL TEMPERATURES

At Centreville, Reynolds County, Mo., by Murdock McKenzie, M. D.

Date..........	March, 1890.				April, 1890.				May, 1890.			
	Sunshine maximum......	Night minimum.	Soil.		Sunshine maximum......	Night minimum.	Soil.		Sunshine maximum......	Night minimum.	Soil.	
			3 feet deep	5 feet deep			3 feet deep	5 feet deep			3 feet deep	5 feet deep
1.....	31	+ 1	42	44.5	......	......	......	......	87	50	54	51
2.....	39	— 1	42	44.5	57	38	45	45.5	86	41	54	51.5
3	60	13	41	44	78	52	45	45 5	79	57	54	51.5
4.....	47	24	41	44	68	43	46	45.5	94	52	55	52
5.....	26	21	40.5	44	74	42	46.5	45.5	65	47	55	53
6....	38	— 8	40	43.5	82	41	47	46	59	31	55	52.5
7.....		21	40	43.5	91	43	48	46	69	37	55	52.5
8.....	50	15	39.5	43	93	63	49	46.5	75	32	55	52.5
9.....	51	15	39.5	43	63	46	49	46.5	79	45	54.5	52.5
10.....	49	35	39 5	42.5	71	27	50	47	81	55	55	52.5
11.....	63	46	40	42	82	33	49.5	47.5	81	47	55	53
12.....	63	41	41	42	83	58	50	48	89	56	55.5	53
13.....	64	29	42	42.5	88	51	50	48	63	56	56	53
14.....	63	21	42	42 5	61	48	51	48	75	47	56.5	53.5
15.....	38	11	42	42.5	......	43	51	48	83	39	57	53.5
16.....	49	+ 9	41.5	43	58	43	51	48 5	75	37	57	53.5
17.....	82	21	41.5	43	56	46	51	48.5	83	37	57	54
18.....	72	21	42	43	80	38	50.5	49	86	57	57	54
19.....	67	36	42	43	80	32	50.5	49	86	54	57.5	54
20....	70	36	42.5	43	76	36	51	49	83	42	57.5	54
21.....	70	44	43	43	80	37	51	49	87	52	58	54.5
22.....	69	42	44	43.5	61	54	51.5	49	94	54	58	54.5
23.....	71	23	44.5	44	80	58	51.5	49.5	96	58	59	54.5
24. ...	76	46	45	44	79	59	52	49.5	88	56	59.5	55
25.....	76	34	45.5	44.5	54	50	53	50	84	52	60	55.5
26.....	76	28	46	44.5	73	47	53	50	86	45	60	55.5
27.....	82	44	46	45	78	35	53	50.5	86	43	60	56
28.....	......	......	46	45	84	36	53	50.5	87	43	60	56
29.....	......	24	46.5	45.5	82	42	53.5	51	92	45	61	56.5
30.....	......	......	46	45.5	89	37	53.5	51	93	53	61	56.5
31.....	......	32	46	46	......	......	.....	......	96	53	61	56.5

TEMPERATURES AT CENTREVILLE—Continued.

Date..............	June, 1890.				July, 1890.				August, 1890.			
	Sunshine maximum..........	Night minimum.	Soil.		Sunshine maximum........	Night minimum.	Soil.		Sunshine maximum........	Night minimum.	Soil.	
			3 feet deep.	5 feet deep.			3 feet deep.	5 feet deep.			3 feet deep.	5 feet deep.
1.....	101.	53	61.5	57	102	64	71.5	65	104	67	71	67.5
2.....	97	61	62	57	101	58	72	65	104	63	71.5	67.5
3.....	93	53	63	57.5	103	56	72	65.5	103	64	72	67.5
4.....	90	65	64	58	104	61	72	65.5	92	64	72	68
5.....	84	58	64	58	95	46	72	66	98	66	72	68
6.....	82	54	64	58.5	102	42	72	66.5	101	61	72	68
7.....	77	45	64	59	105	56	71.5	66.5	100	66	72	68
8.....	71	53	64	59	106	65	72	66.5	101	62	72	68
9.....	84	57	64	59.5	102	66	72	66.5	100	66	72	68
10.....	85	51	63.5	59.5	96	60	72	66.5	90	64	72	68
11.....	89	57	64	59.5	101	53	72	67	87	46	72	68
12.....	92	55	64	59.5	104	61	72	67	95	41	72	68.5
13.....	96	56	64	60	104	68	72	67.5	83	55	72	68.5
14.....	98	60	65	60	104	67	72	67.5	94	63	71	68.5
15.....	95	63	65	60	93	68	72	67.5	98	60	71	68.5
16.....	100	62	66	60.5	100	71	72	67.5	95	58	71	68
17.....	96	61	66	60.5	103	68	72.5	67.5	86	58	71	68
18.....	100	65	66	61	95	72	73	67.5	92	64	71	68
19.....	100	61	67	61	97	68	73	67.5	99	64	71	68
20.....	97	65	67	61.5	79	63	73	68	88	64	71	68
21.....	98	61	68	62	......	59	.....	......	89	68	71	68
22.....	101	62	68	62	......	......	.....	......	90	51	71	68
23.....	103	63	68.5	62.5	95	58	72	68	84	46	70.5	68
24.....	102	61	69	62.5	92	60	71.5	68	81	46	70	68
25.....	107	64	70	63	92	55	71.5	68	100	58	70	68
26.....	105	65	70	63	95	53	71	68	80	65	70	67.5
27.....	.....	65	......	.....	96	55	71	67.5	91	55	70	67.5
28.....	106	65	71	64	98	55	71	67.5	92	52	69.5	......
29.....	105	64	71	64	101	55	71	67.5	95	53	69.5	67
30.....	103	66	71	64.5	99	60	71	67.5	91	53	69.5	67
31.....	....	......	......	.....	104	62	71	67.5	91	51	69.5	67

TEMPERATURES AT CENTREVILLE—Continued.

	September, 1890.				October, 1890.				November, 1890.			
			Soil.				Soil.				Soil.	
Date........	Sunshine maximum........	Night minimum	3 feet deep	5 feet deep	Sunshine maximum........	Night minimum	3 feet deep	5 feet deep	Sunshine maximum........	Night minimum	3 feet deep	5 feet deep
1.....	......	46	......	......	81	53	62.5	63.5	77	22	54	57.5
2.....	......	......	......	......	80	54	62.5	63	63	33	54	57.5
3.....	......	......	......	......	76	55	62.5	63	56	35	54	57
4.....	......	......	......	......	83	57	62.5	63	74	23	53	56.5
5.....	99	......	69	67	68	57	62.5	63	83	26	53	56
6.....	99	64	69.5	67	68	52	63	63	74	53	53	56
7.....	99	64	70	67	83	43	63	63	70	54	53	56
8.....	75	60	70	67	83	40	63	63	74	47	53.5	56
9.....	71	60	70	67	79	41	63	62.5	55	45	54	55.5
10.....	79	61	69	67	87	49	63	62.5	47	33	54	55.5
11.....	92	62	69	67	86	51	62.5	62.5	44	35	54	55.5
12.....	76	56	69	67	96	55	62.5	62	67	40	54	55.5
13.....	75	39	68.5	67	79	58	63	62	67	22	53	55.5
14.....	60	39	68	67	74	34	63	62	69	24	52.5	55
15.....	88	52	67	66.5	66	32	63	62	56	42	52	54.5
16.....	84	52	66.5	66.5	73	47	62	62	56	43	52	54.5
17.....	86	43	66	66.5	77	28	61	61.5	70	51	52	54.5
18.....	90	47	66	65.5	75	36	60.5	61.5	81	28	52.5	54.5
19.....	80	56	66	65.5	74	28	60	61.5	78	27	52	54
20.....	84	40	66	65.5	73	26	60	61	76	24	52	54
21.....	86	50	66	65.5	60	43	59	60.5	82	26	52	54
22.....	86	58	66	65	56	43	58	60	65	38	52	54
23.....	64	53	66	65	73	33	58	60	75	16	51	53.5
24.....	60	54	65.5	65	83	31	58	59.5	71	34	51	53.5
25.....	65	58	65	65	76	33	57.5	59.5	74	26	51	53.5
26.....	74	55	65	65	60	39	57	59	59	26	50	53
27.....	70	53	64.5	64.5	65	22	57	59	68	20	50	53
28.....	68	37	64	64.5	74	25	56	58.5	65	20	50	53
29.....	53	35	64	64	64	45	56	58.5	69	25	49	52.5
30.....	63	48	63	64	45	38	56	58	61	30	49	52
31.....	81	53	62.5	63.5	58	16	55	58	......	......	......	......

TEMPERATURES AT CENTREVILLE—Continued.

Date.	December, 1890.				January, 1891.				February, 1891.			
	Sunshine maximum	Night minimum.	Soil.		Sunshine maximum	Night minimum.	Soil.		Sunshine maximum	Night minimum.	Soil.	
			3 feet deep	5 feet deep			3 feet deep	5 feet deep			3 feet deep	5 feet deep
1	......	......	.....	.....	59	43	41.5	45	47	32	41	42.5
2	......	......	......	....	49	26	42	45	61	17	41	42.5
3	......	..	......	......	51	11	42	44.5	39	+ 9	41	42.5
4	37	13	47	51	56	12	41	44.5	47	+ 9	40	42.5
5	60	24	47	50 5	61	21	41	44.5	57	15	40	42
6	46	38	47	50	61	15	41	44	61	21	39.5	42
7	26	26	46	50	41	29	41	44	59	37	39.5	42
8	43	17	46	49.5	30	30	41	44	58	23	40	42
9	55	— 2	45.5	49.5	41	29	41	44	29	24	40	42
10	83	18	45	49	41	32	41	44	52	+ 9	40	42
11	71	27	45	49	32	†	†	†	56	12	40	42
12	47	21	44.5	48.5	34	21	40.5	44	68	25	40	42
13	53	11	44	48.5	46	— 6	40	43.5	68	22	39.5	42
14	61	18	44	48	75	+ 8	40	43.5	60	18	40	42
15	57	17	43	48	50	17	39.5	43	46	26	40	42
16	53	26	43	47.5	49	13	39	43	66	46	40	42
17	54	20	43	47.5	50	25	39	42.5	73	44	41	42
18	74	13	43	47	55	+ 6	39	42.5	35	22	42	42 5
19	44	18	42 5	47	58	11	39	42.5	32	25	42	42 5
20	64	38	42.5	46.5	57	15	39	42.5	58	......	41	42.5
21	60	40	43	46.5	58	28	39	42.5	59	30	41	42 5
22	64	13	43	46.5	40	26	39	42	58	16	41	42.5
23	61	24	43	46.5	55	21	39	42	59	42	41	42.5
24	34	16	42.5	46	50	20	39	42	74	53	41.5	42 5
25	*	*	*	*	60	12	39	42	48	24	42	42.5
26	......	26	42	46	65	21	39	42	36	14	42	42 5
27	50	......	42	45.5	65	24	39	42	45	+ 6	42	42.5
28	46	+ 7	41 5	45.5	50	36	39	42	39	19	41	42.5
29	73	18	41	45.5	61	41	39.5	42	......	......	.....	......
30	45	23	41	45	50	21	40	42	......	......	......	......
31	63	40	41	45	53	36	41	42	......	......	......	......

* All iced over. † Snow-covered.

The maximum soil temperature at 3 feet deep, of 75°, occurred from the 22nd to 25th August, 1886. The maximum soil temperature at 5 feet deep, of 72°, from the 22d to 30th August, 1886. 54° on the down grade was reached on Nov. 6 for 3 feet deep, and 54° on Nov. 18 for 5 feet deep.

The minimum for 3 feet deep was 34° from 22d to 25th Jan., 1887. The minimum for 5 feet deep was from Jan. 23 to Feb. 9, 40°, with a rise to 40.5° between. On the up grade, the 3 feet reached 54° on May 2, and the 5 feet on May 8 and 9.

The maximum for 1887: 3 feet, 73° Aug. 4 to 18, with drop to 72.5° between; 5 feet, 71° from 14th to 26th Aug.; 54° down grade, 3 feet Oct. 30; 54°, 5 feet Nov. 22 1887.

The minimum for 1888: 3 feet, 34.5° Feb. 7 to 17; 5 feet, 40°, Jan. 31 to Feb. 22; 54° on up grade for 3 feet, April 26; 54° on up grade for 5 feet, May 2 to 5.

Maximum for 1888: 3 feet, 73°, August 3 to 5; 5 feet, 70°, August 4 to 26; 54° on down grade, 3 feet Nov. 10; 54° on down grade, 5 feet Nov. 21, 22.

The minimum for 1889: 3 feet, 37.5°, Feb. 12 to 14; 5 feet, 41°, Feb. 12 to 16; 54° on up grade, 3 feet May 3; 54° on up grade, 5 feet, missed, but 55° on 16th May.

Maximum for 1889: 3 feet 71°, July 22 to 24; 5 feet 67°, July 31 to Aug. 1; 54° on down grade, 3 feet Nov. 4; 54° on down grade, 5 feet Nov. 2 to 4.

The daily readings being given for the parts of the years 1890 and 1891, covering the minimum and maximum speak for themselves and need no comment; but it may be well enough to explain to those who have not watched soil temperatures at all hours of the day that heat and cold travel downward in waves, following the daily maximum which occurs at any time independent of clouding or clearing in sunshine from 9 a. m. to 4 p. m., but normally from noon till 30 minutes past.

The daily minimum here is at sunrise, not as given in the books at an hour or two before.

The 3-feet-deep instrument takes from 24 to 30 hours for a hot or cold wave to reach it, and the 5-feet-deep, 48 hours to reach it; so that the one is a register of the day before the reading and the other of two days before the reading.

There is one caution to remember in relation to foregoing remarks—that is, that in imported weather from other localities, we may have the daily maximum at night, and the daily minimum at noon reversing the normal time. This is well seen in the table of Erratic Temperatures.

The yearly range from minimum to maximum or downward is not gradual or uniform, but is accomplished by a series of impulses or blows, each harder or more forcible than the preceding, with a reaction or rebound in the interval; this is seen in all the instruments, and for want of a better name is what I call the Cyclonic range.

The extreme range here of temperature between a man's feet and his face, or between the collar of the root and top of a raspberry bush, so far as observed, is 174°; that is in other words, the greatest summer heat at the surface of the soil was 150°, and the greatest winter cold of air at five feet above surface of soil was 24° below zero. This is what plants, animals and man have to contend with; this is the yearly range truly; from this range it goes down to nothing at all, but stands at 54° at some depth of soil unknown at present. We know that this reservoir of heat at 54° exists from the following facts: On my place there is one spring that the yearly range is from 48° to 60°, the mean of which of course is 54°; there are also two caves, in one of which is a lake and several bold springs all of which stand at 54° the hottest day of summer or coldest of winter, or any time between; this proves the fact of the reservoir; but we do not know if it is gaining or losing heat or if the top line of 54° is rising or falling, or in other words is the earth gaining or loseing heat?

This bottom heat needs study, as it has an immense influence on all instruments at intermediate depths, acting as a spring or elastic force from below to push up the readings specially noticeable when they get below itself, viz. 54°.

SOIL AND SUNSHINE TEMPERATURES

At Centreville, Reynolds County, Mo., by Murdock McKenzie, M. D.

JUNE 20, 1885.

	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	Sunset
Shade	65	72	78	80	83	86	87	92	96	92	92	92	87	82	73
Sunshine	65	73	82	83	89	92	96	96.5	97	99	100	101	84	82	*
Soil surface	67	74	85	83	98	102	104	106	108	108	104	100	84	82	76
Soil 3 inches	71	72	74	75	78	81	83	84	86	88	88	89	84	84	82
Soil 12 inches	72	72	72	72	72	72	72	73	73.5	74	75	75.5	76	76	76
Soil 16 inches	71	71	71	71	71	71	71	71	71	71	71	72	72	72	72

*Shaded.

JULY 16, 1885.

	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.
Shade	66	73	81	84	87	89	91	91	92	90	89	83	80	74
Sunshine	69	77	87	93	95	98	98.5	99	98	99	94.5	89	82	....
Soil surface	70	82	91	98	106	111	109	110	109	104	98	89	82	79
Soil 3 inches deep	75	76	77	80	83	86	88	89	90	91	91	90	88	86
Soil 12 inches deep	77	77	77	77	77	77	77	78	79	79	80	80	81	81
Soil 16 inches deep	76	76	76	76	76	76	75	76	76	76	76	76	76	77

AUGUST 14, 1885.

	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.
Shade	52	55	61	64	65	73	75	78	75	76	76	74	72	67	60
Sunshine	55	58	71	81	86	90	95	95	93	93	83	83	*	*	*
Soil surface	60	62	72	82	90	104	111	115	116	113	107	91	81	76	72
Soil 3 inches	72	72	72	74	76	78	82	86	89	92	93	93	91	87	84
Soil 12 inches	79	79	78	78	78	77.5	77.5	78	78.5	79	80	81	81	81	81
Soil 16 inches	78	77	77	77	77	77	77	77	77	77	77	77	77	77	77

*Shaded by corn.

SEPTEMBER 19, 1885.

	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.
Shade	63	65	71	74	79	81	73	86	80	77	78	72	67
Sunshine	65	66	72	82	82	90.5	79	93	89.5	85	83	73	....
Soil surface	65	67	72	78	79	84	80	86	88	81	78	72	69
Soil 3 inches deep	68	68	69	71	72	74	76	77	78	78	78	77	76
Soil 12 inches deep	71	71	70	70	70	70	70	70	71	71	72	72	72
Soil 16 inches deep	69	69	69	69	69	69	69	69	69	69	69	69	69

OCTOBER 16, 1885.

	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	Sunset
Shade	36	38	44	50	61	70	76	76	76	75	73	64	58
Sunshine	36	39	49	62	80	87	91	89	92	94	84	65	....
Soil surface	40	41	45	57	72	82	86	85	82	72	66	62	58
Soil 3 inches deep	48	49	49	50	52	55	60	63	65	67	67	66	64
Soil 12 inches deep	54	54	54	54	54	54	54	54	55	56	57	57.5	58
Soil 16 inches deep	53	53	53	53	53	53	53	53	53	54	54	54	54

NOVEMBER 16, 1885.

	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.
Shade	25	31	35	46	56	60	60	59	58	55	46
Sunshine	26	31	45	56	67	70	71	70	69	68	....
Soil surface	31	32	42	55	63	64	65	60	54	49	42
Soil 3 inches deep	39	39	39	40	43	46	48	50	50	50	50
Soil 12 inches deep	44	44	44	44	44	44	44	45	45	45.5	46
Soil 16 inches deep	43	43	43	43	43	43	43	43	43	43	43

DECEMBER 18, 1885.

	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	Sunset
Shade	16	18	25	34	43	52	51	52	52	47	38
Sunshine	*	*	32	47	61	76	77	71	68	54	....
Soil surface	24	24	32	34	35	43	45	44	40	33	31
Soil 3 inches deep	32	32	32	32	32	32	32	32	32	32	32
Soil 12 inches deep	35	35	35	35	35	35	35	35	35	35	35
Soil 16 inches deep	36	36	36	36	36	36	36	36	36	36	36

*Shaded by hill on east.

JANUARY 18, 1886.

	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.
Shade	—8	—4	+4	16	26	33	32	32	31	29	24
Sunshine	*	*	26	32	47	41	43	43	38	32	....
Soil surface	12	14	19	32	44	44	39	31	30	28	26
Soil 3 inches deep	24	24	24	26	28	30	31	31	32	32	31
Soil 12 inches deep	32	32	32	32	32	32	32	32	32	32	32
Soil 18 inches deep	34	34	34	34	34	34	34	34	34	34	34

FEBRUARY 15, 1886.

	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	Sunset
Shade	28	28	30	32	35	38	37	36	36	33	28
Sunshine	—	31	37	43	46	48	49	47	49	47	—
Soil surface	30	30	33	48	54	55	56	53	47	34	28
Soil 3 inches deep	34	34	35	35	36	38	40	41	41	40	38
Soil 12 inches deep	35	35	35	35	35	35	36	36	36.5	37	37
Soil 18 inches deep	35	35	35	35	35	35	36	36	36	36	36

MARCH 18, 1886,

	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	Sunset
Shade	34	38	50	64	70	76	80	81	81	80	77	73	70
Sunshine	....	41	58	74	78	86	90	87	86	85	81	77	....
Soil surface	36	42	56	66	75	83	84	84	80	76	69	63	57
Soil 3 inches deep	43	43	44	47	52	55	58	60	62	63	62	61	59
Soil 12 inches deep	46	46	46	46	46	46	47	47	48	49	50	50	50
Soil 18 inches deep	45	45	45	45	45	45	45	45	45	45	46	46	46

APRIL 20, 1886.

	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	12 m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.
Shade	41	45	52	63	73	78	81	82	89	80	78	78	77	70	62
Sunshine	....	48	56	69	86	88	91	91	92	89	84	83	*	*	*
Soil surface	43	49	60	72	84	87	91	90	94	82	80	80	80	63	60
Soil 3 in. deep	53	53	53	56	60	62	66	68	70	72	71	71	70	68	66
Soil 12 in. deep	56	56	56	56	56	56	57	57	58	58	59	60	61	61	61
Soil 18 in. deep	56	56	56	56	56	56	56	56	56	56	56	56	56	57	57

*Shaded.

MAY 18, 1886.

	5 a. m....	6 a. m....	7 a. m....	8 a. m....	9 a. m....	10 a. m....	11 a. m....	12 m....	1 p. m....	2 p. m....	3 p. m....	4 p. m....	5 p. m....	6 p. m....	Sunset..
Shade...........	37	43	51	59	65	70	75	78	81	79	78	77	72	66	57
Sunshine........	37	45	54	65	75	80	84	86	91	89	86	82	75	*	*
Soil surface.....	44	52	63	78	88	96	102	98	109	94	83	86	75	68	60
Soil 3 in. deep..	54	54	55	59	63	68	72	77	80	81	81	80	78	75	72
Soil 12 in. deep..	62	61	61	60.5	60.5	61	62	63	64	65	66	67	68	68	68
Soil 18 in. deep..	63	63	62	62	62	61.5	61.5	61.5	61	61	62	62.5	63	63	63.5

*Shaded.

REMARKS.

June 20, 1885—Barometer 29.26 at 7 a.m. and 29.27 at noon; wind light; weather partly cloudy.

The remarkable point is that the sunshine maximum was not reached until 4 p.m., after which it fell rapidly.

July 16, 1885—7 a. m, barometer 29.20; wind calm; weather foggy; 12 m., barometer 29.27; wind south; fresh; weather partly cloudy.

Sunshine maximum at 1 and at 3 p.m.; minimum at night 63.

August 14, 1885—7 a.m., barometer 29.32; wind light; west; weather cloudless; 12 m., barometer 29.33; wind fresh; north; weather cloudless.

There are two points in the sunshine temperature to notice: First, the accelerated and sustained maximum from 11 a.m. to 12 m.; second, on setting the instrument at 3 p.m., it broke connection at 83, then rose at intervals between 3 and 4 p. m. to 88; minimum at night 52.

September 19, 1885—Barometer stationary at 29.40 minimum; at night 58; the sun did not get through fog until 8.45 a.m.; then clouds from southeast until 10 a.m.; cloudless at 11 a.m.; cloudy at noon; at 3 p.m. partly cloudy and wind shifted to southwest.

October 16, 1885—Barometer 7 a. m., 29.03; noon, 29.10; minimum at night, 36; sunshine maximum, 94, reached a little before 3 p. m.; light south winds in morning, then variable from north to east, then back to north again; not a speck of clouds visible until after 3 p. m, when a few cirro-cumulus drifted across the northern sky a little south of east.

November 16, 1885—Barometer 7 a. m, 29.30; noon, 29.38; wind light, southwest to south; cloudless; the sunshine maximum of 71 was reached at 12:30 p. m.

December 18, 1885—Barometer 29.45 at 7 a. m; 29.50 at noon; wind calm; weather cloudless; snow on the ground since 13th instant, when 4.5 inches fell, but was cleared away from the surface instruments; minimum, 16 at night.

January 13, 1886—Barometer 7 a m., 29.60; noon, 29.59; minimum at night, 8 below zero; cloudless; light southerly winds; three inches of snow on ground.

February 15, 1886—Barometer 7 a. m., 29.48; noon, 29.60; wind fresh, northerly; cloudy at 7 a. m.; cloudless at noon; minimum 26.

March 18, 1886—Barometer 7 a. m. 29.20; noon 29.17; wind south, light to fresh; weather partly cloudy; normal maximum of sun at noon.

A good type of all instruments; a forming low barometer increasing temperature. The only pity is that the observations were not continued for 24 hours, so as to get the time of maximum at 12 and 18 inches deep.

April 20, 1886—Barometer stationary at 29.50; 7 a. m., wind calm, weather cloudless; noon, wind fresh, southwest; weather partly cloudy; minimum 41.

May 18, 1886—Barometer stationary 29.25; minimum 37; wind light, northeast to northwest; cloudless in forenoon; partly cloudy at noon.

Minimum at 18 and 12 inches plainly shown.

MURDOCH MCKENZIE, M. D.,
Voluntary Observer.

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*Shaded by hills.

MAXIMUM, MINIMUM AND ABNORMAL TEMPERATURES.

First and last frosts from 1878 to 1890.

Reported by Murdock McKenzie, Centreville, Reynolds county, Mo.

Year.	Maximum.		Maximum Sunshine.		Minimum.		Abnormal temperatures.								Last frost.		First frost.	
							High night minimum.		Low day maximum.		High sunshine		Low winter.					
	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date	Deg.	Date.	Deg.	Date.	Deg.	Date.
1878	100	Aug. 24	....	....	......	....	68	April 22	77	Aug. 25	......	....	—11	Dec. 25	30	April 10	32	Sept. 12
1879	100	July 16	......	....	—18	Feb. 4	70	May 10	63	Aug. 15	......	....	3	Dec. 25	32	May 7	30	Oct. 19
1880	102	Aug. 18	......	....	—18	Dec. 31	64	Jan. 11	66	July 2	......	....	—16	Nov. 18	28	May 1	32	Sept. 14
1881	104	Aug. 11	......	....	—10	Jan. 14	74	Sept. 9	44	Aug. 17	......	....	6	Nov. 25	26	April 16	30	Oct. 25
1882	96	July 1	......	....	2	Jan. 17	60	Feb. 12	66	July 7	......	....	— 4	Dec. 7	30	May 17	27	Oct. 20
1883	95	July 12	106	July 12	— 5	Jan 21	71	Aug. 14	58	July 30	91	April 13	5	Nov. 16	31	May 23	31	Oct. 15
1884	96	July 2	105	Sept. 7	—24	Jan. 5	52	Feb. 4	68	July 15	82	Mar. 11	—14	Dec. 26	28	April 25	30	Oct. 15
1885	97	July 29	112	July 29	—13	Jan. 28	59	April 22	66	July 3	82	Mar. 10	— 5	Dec. 15	30	May 11	32	Oct. 10
1886	103	Aug. 17	117	Aug. 17	—22	Jan. 12	.....	....	66	Aug 29	90	Mar. 18	— 6	Dec. 5	32	April 27	27	Oct. 1
1887	...	......	111	July 30	—15	Jan. 10	56	Jan. 22	75	June 23	87	Mar. 1	5	Nov. 28	25	April 24	25	Oct. 12
1888	100	July 13	112	July 13	— 5	Jan. 15	66	April 5	76	June 11	76	Feb. 1	......	....	31	May 14	30	Sept. 28
1889	......	....	107	July 19	2	Feb. 7	52	Feb. 16	......	....	81	Feb. 16	......	....	32	June 1	32	Sept. 27
1890	97	July 7	106	July 8	— 8	Mar. 6	59	Jan. 11	64	Aug. 24	82	Jan. 11	16	Oct. 31	32	May 8	32	Oct. 15

METEOROLOGY OF THE HILL COUNTRY OF SOUTHERN MISSOURI.

From the very short notice given with the request for data from this station, for publication in report of State Board of Agriculture, after copying the accompanying tables, barely a glance or word can be added to direct attention to special points suggested by the tables.

But from the importance of the subject to agricultural meteorology, touching as it does plant, animal and man's life and thrift, I will take the table for May as a text for a few condensed remarks:

There need be little said on shade temperatures; the whole world has been working on shade temperatures with but little result for the time, labor and expense spent on it, being dissatisfied with it. When I received my new Green's Standard maximum and minimum instruments in 1883, I began observations on sunshine and soil temperatures, the maximum instrument being set in the open air so as to get as near as possible the heat of sunshine falling on an ear of corn. After awhile I began to notice that the time of the maximum did not correspond with the time of shade given in the text-books; closer observation revealed the fact that the time of maximum sunshine is movable, and occurs at any and all times from 9 a. m. to 4 p. m., and seems to be closely connected with and a warning of the passage of storms; whether this is a local or a general law, I am unable to say, and it can only be proven such by similar observations at other stations, showing its presence or absence; in either case it is important to know it.

The surface soil instrument was also a revelation, showing as it does a wonderful increase of heat over the sun's heat in the air, amounting sometimes to as much as 50° difference; this difference must have an immense effect on the expansion and circulation of sap in the plant, to say nothing of other questions that might be raised, as, what is heat? where is it made? in the sun? in the earth, or in both together at the surface?

The instrument, at three inches deep in the soil, shows some interesting points; it begins to rise two hours after sunrise, and begins to decline two or three hours after the maximum of the day, dependent somewhat on the dryness or dampness of the soil.

In the instrument at twelve inches deep, we have a different state of affairs; the maximum has evidently been some time in the night; it is falling at sunrise and continues falling till 9 a. m., and begins to rise at 10 a. m.

In the eighteen-inch-deep instrument we have the same conditions only more pronounced, falling from sunrise till noon, then rising till we know not when.

The winter of 1880-1881, although it does not give the greatest absolute cold of some of the years, is remarkable and well worth study in several respects. On the 17th of November, 1880, snow fell and lay on the ground till February 7, 1881, and my corn was not gathered out of the field on account of it till February 3—a thing that has never occurred before or since in 24 years. Then again, the minimum is the earliest of the record, being—18° on December 31; comparing this with the latest, March 6, 1890, gives a range of time of 66 days; but as early as November 18, long before the winter solstice, it was only 2° less, being —16°, and on the 19th of November, —14°. There are other remarkably low groups of temperature:

On November 22, 4° below zero.
On November 23, 4° below zero.
On December 28, 4° below zero.
On December 29, 14° below zero.
On December 30, 6° below zero.
On January 1, 1881, 10° below zero.
On January 7, 10° below zero.
On January 14, 10° below zero.

The table of minimum, maximum and erratic temperatures is interesting and valuable, and a true key in small space to the climate of this station, and in it we begin to get an answer to the question I have been asking myself for years when I became a voluntary observer, which was. Why is it that cabbage will not stand the winter here, yet stands it in Scotland 20 degrees farther north than this? or the fuschia stands neither winter nor summer outdoors here without protection, yet there it lives and thrives with none? In the table we find that the range of the minimum is from 24° below zero on the 5th of January, 1884, the greatest, to 2° above zero on the 2d of February, 1889, the least; and that the time varies from the 5th of January, 1884, the earliest, to the 6th of March, 1890, the latest.

The maximum is not so easily dealt with; 1884 is a good example of that; in it we find 94° shade, 102° sun, on June 23; 96° in shade, 100° sun, July 2; 93° shade and 102° sun, July 12; 94° shade, 102° sun. August 29; and 92° shade, 105° in the sun on September 7; now which of these is the true maximum?

Erratic temperatures we find injected into every month, summer into winter, winter into summer, day into night and night temperature into day. But this opens up the whole domain of meteorology, and is too big a job to go into here.

The first and last frosts are simpler, although they belong to the same category, the range of time extending from April 10, in 1878, to June 1, in 1889, for last frosts, being a range of 53 days. First frosts range from September 12, the earliest, to October 25, the latest in 1881.

Had time permitted, more might have been said, but as it is, we will have to trust the tables to tell their own tale.

I may add, to give an idea of the typographical features of the station, that, while the barometer at the house stands at 29.25 inches, attached thermometer 65°, at the level of Black river it is 29.30; while on top of hill, about 600 yards east, it stands at 28.80, which is the highest point of the Ozark range in this county.

MURDOCK MCKENZIE.

LIGHTNING RODS.

BY A. L McRAE.

If you rub a glass rod with a piece of flannel, it will acquire the property of attracting to itself bits of paper and other small bodies. Many other substances will act in a similar manner to the glass rod. The fact that yellow amber, when rubbed, possesses the peculiar property of attracting to itself bits of straw and dry leaves, was known to the ancients many centuries before the Christian era. Thales of Miletus, about 600 B. C., imagined that the rubbing of the amber awakened slumbering spirits within, that came forth after the small bodies and again returned to the amber. To the ancients, whose superstition allowed their imagination to run riot without the guiding influence of reason, it was easier to believe in this theory than to investigate the cause and find the truth. For the same reason we find the Greeks and Romans regarding thunder and lightning as Jovian darts. Indeed, up to about a century and a half ago, thunder and lightning were considered beyond the pale of physical investigation.

In the year 1600, Dr. Gilbert, of England, published some experiments he had made with amber and other substances that acted in a similar manner. To these substances he gave the name "Electrics," and he employed the term "Electricity" to denote the peculiar property the electrics possess when excited by friction.

It was soon noticed that electricity bore certain resemblances to lightning. Benjamin Franklin, who was one of the foremost experimenters in the new science, as early as 1749 suggested the use of lightning rods for the protection of buildings, and in the following year published seven points of resemblance between the electric spark and lightning. In 1752 Franklin made his celebrated kite experiment, by which he proved conclusively that they were identical, and in the following year he again suggested the use of lightning rods. The clergy objected to the idea because it was irreligious; they said that since a child ought not to object to the chastisement of his father, we, likewise, ought not to try to shun the wrath of God. But experience has shown, in science as well as elsewhere, that knowledge is power, and that Nature is the willing servant of him who knows her laws. Our knowledge of electric laws has increased wonderfully since Franklin's time, so that, to-day, if we know what conditions exist, we can foretell with almost certainty what results will follow.

Probably in no other branch of science has there been as much deception, imposture and swindling as there has been in lightning rods. A poorly put up lightning rod is worse than no rod, for it not only does not protect, but it makes a kind of lightning trap. It is probably due to the poorly-constructed lightning rods that some people doubt the efficiency of lightning rods; for on board of ships, where the rods have been put up by government officials who understood what was required, statistics prove their efficiency.

An ideal lightning protector would be a hollow metallic sphere. If we had such a sphere and got inside of it, all the lightning in the world could play on the outside without disturbing us in the slighest degree. Therefore, if we enclose a building in a rough cage it will have the best possible protection. The walls of the cage need not necessarily be solid. Of course, if they are it is all the better, but they may be formed of a net-work of conducting material which will admirably protect the building. The rods in this case must be connected together, both on the top and underneath the house. All metal roofing and pipes must also be connected to the rods. Then the lightning striking the house will find it easier to follow the cage around to the ground than to jump across the house to it.

PRACTICAL POINTS.

To make lightning rods serve the purpose for which they are intended, there are three points to be considerd:

First.—The rods must be high enough and close enough together to protect every point of the building. To determine whether any particular point is protected by a rod, see whether it is below an imaginary line drawn from the top of the rod to the ground, making an angle of forty-five degrees with the rod; if it is, it is protected.

Second.—The rods must be of such material and of such size that they will carry off, without injury, the most powerful electrical discharges that will strike them. It is well agreed that it is *mass* (weight) and not *surface* that is required. Therefore, a rod having a circular or a rectangular cross section, is the best form. Flat and fancy rods only increase the surface and the liability to become injured by rust. On account of their structural and electrical properties *copper* and *iron* are the best materials for lightning rods. To prevent rust, the iron must be galvanized.

The copper rods ought to weigh from one-third to two-thirds of a pound to the running foot, and the iron from two to three pounds to the foot. As a solid rod of iron of the necessary size is hard to bend around angles, a rope made of galvanized iron wire can be used.

Third.—The connections are the most important part of lightning rods. Almost all of the accidents to buildings having rods are due to defective connections. Indeed, a lightning rod with poor connections, instead of being a protection to the house, is actually a menace to it. The rods ought not to be insulated, but nailed directly to the building. Insulators if not hurtful are useless, for lightning having force enough to come several miles through the air is not going to pay any attention to a few inches of glass. All metal roofing and pipes must be put in electrical connection with the rods. Almost any rod used will act as a point, but if the rod is of soft material it is liable to be fused by the lightning, and the heated particles fall on the roof and set the house on fire. Therefore, it is best to have the rod terminate in a point plated with platinum or some other hard non-oxidizable substance. It is also best to have two or three points on each conductor, so that an injury to one will not make the rod unserviceable. Rods must not be jointed by screws, but must be soldered, using a generous amount of solder.

The most important point is to have a good connection with moist earth. In cities, a water or a gas main makes a good ground. A rod let down in the water of a well is a good ground, but a cement-lined cistern is no good as a ground. If none of these grounds can be obtained, let the rod go down into the soil to a depth of ten feet, and terminate in a large plate of sheet-iron, and fill in the space around the rod with charcoal.

I would advise every one who has lightning rods on his house to examine them and see if they fulfill the above conditions. If the rods be too small, the lightning will fuse them and set the house on fire. If the joints are not well connected, and if the end of the rod is not connected to a good ground, the lightning striking the rod will jump across to any good conducting substance in the neighborhood, and do more damage than if the rod had not been there.

Some one will object by saying, "My house has been protected by poor rods, and there is no need to have any better." If the house has poor rods and has not been struck, it is safe to say that it would not have been struck if it had had no rods. Others will say, "My house has no rods and has never been struck, therefore I have no need for the lightning rods." But because a man's house has never been destroyed by fire, that is no guarantee that it will always be safe. And where possible misfortunes may be avoided at a trifling expense, it is our duty to take the necessary precautions.

Electricity is of two kinds, called for convenience, negative and positive. Whenever either kind is collected in the clouds, an equal amount of the opposite kind is collected at some point of the ground underneath the cloud. It may be collected in other clouds, but I only refer to the kind that will strike the earth. These two quantities of electricity attract one another, but are held apart by the intervening air, which is a poor conductor of the electric fluid. But when the attracting force becomes strong enough to cause the electricity to jump across the air, the result is lightning and thunder. Now as some soils and earths act as better reservoirs for collecting the electric fluid than others, the electric discharges between the earth and the clouds will take place more easily at certain points than at others. Our house may or may not be over one of these reservoirs; we cannot tell, but we can take such precautions that will make it safe if it is. If it is not over one of these places, it will be safe any way, and the rods will do no harm. Large trees having deep roots near a house is a protection against lightning.

Days on which Thunder Storms occurred in Missouri during 1890.

Date.	January	February	March	April	May	June	July	August	September	October	November	December	Total
1	*	....	....	....	*	*	....	*	....	*	....	....	5
2	....	....	....	*	....	....	....	*	*	*	....	....	4
3	....	....	....	*	*	*	*	*	*	*	....	....	7
4	....	....	....	....	*	*	....	*	*	*	....	....	5
5	....	....	....	....	....	*	....	*	*	*	....	....	4
6	....	....	....	*	*	....	....	*	*	*	....	....	5
7	....	....	....	*	....	....	*	....	*	....	....	....	3
8	....	....	....	*	*	*	*	*	*	*	*	....	8
9	....	....	....	*	*	*	*	*	*	*	*	....	8
10	....	....	*	....	*	*	*	*	*	*	....	....	7
11	....	*	....	....	....	*	*	....	....	*	....	....	4
12	*	....	....	*	*	*	*	*	*	*	....	....	8
13	....	....	....	*	*	*	*	*	....	*	....	....	6
14	....	....	....	*	*	*	*	*	*	....	....	....	6
15	....	....	....	....	*	*	*	....	....	*	....	....	4
16	....	....	....	....	....	*	*	*	....	*	....	....	4
17	....	....	....	....	*	*	*	*	....	....	....	....	4
18	*	*	*	....	*	*	*	....	*	....	....	....	7
19	*	*	....	....	*	*	*	*	*	*	....	....	8
20	....	....	*	....	*	*	*	*	....	*	....	....	6
21	....	....	....	....	*	....	*	*	....	....	....	....	3
22	*	....	....	*	*	*	*	....	....	....	....	....	5
23	....	*	....	....	*	*	*	....	....	....	....	....	4
24	....	*	*	*	*	....	*	....	....	....	....	....	5
25	....	*	....	*	*	*	....	*	....	....	....	....	5
26	....	*	*	*	....	*	*	*	....	....	....	....	6
27	....	....	*	....	....	*	*	....	....	....	....	....	3
28	....	....	*	....	....	*	....	*	....	....	....	....	3
29	....	....	*	*	*	*	....	....	....	....	....	....	4
30	....	....	*	*	*	*	....	*	....	....	....	....	5
31	*	....	....	....	*	....	*	....	....	....	....	*	4
Sums	6	7	9	15	23	25	22	21	13	16	2	1	160

TORNADOES AND LIGHTNING.

The following extract from the Annual Report of the Chief Signal Officer for 1890, relative to destructive tornadoes and thunderstorms, will be read with interest:

Impressed with the number and violence of destructive tornadoes during the past year, the Chief Signal Officer believed it a timely duty of this office, while investigating recent phenomena of this kind, to also determine, as carefully as could be done from existing data, the average number of tornadoes in the United States, the area devastated by them, the number of lives lost annually, and such other information as might be of current public interest. This work was intrusted to Professor H. A. Hazen, who had given much time and attention to these phenomena, and had published, privately, several studies and memoirs upon the subject.

In investigating tornadoes, great difficulty was experienced in accurately determining property losses or loss of life, the difficulty resulting from exaggerated reports which are invariably spread over the country in connection with public calamities of this kind; for instance, the Louisville tornado of March 27, 1890, was months later reported by the press to have caused a loss of 500 lives instead of 135, the true number. Professor Hazen divided the tornadoes into three classes: first, violent storms causing destruction; third, the most severe tornadoes; and placed in the second class all other known violent storms. While there are about one thousand tornadoes, each, in classes 1 and 2, causing the death of 1,071 people, an average of one person to two storms, and a loss of about $23,000,000 in property, yet there were but 58 tornadoes of a very violent character, killing 755 people and destroying property to the amount of $11,894,700—an average of 13 lives and over $200,000 of property to each storm of class 3.

Several methods of determining the average destructive area covered by tornadoes were tested. In one case the result gives the relation between the total area visited annually by violent storms of all classes to the area of the State, with the following result: In Alabama, one square mile of limited destruction annually to each 7,866 square miles; Arkansas, one to 14,418; Georgia, one to 6,696; Illinois, one to 8,172; Indiana, one to 6,210; Iowa, one to 7,164; Kansas, one to 9,720; Michigan, one to 18,396; Missouri, one to 6,336; Ohio, one to 4,554; Pennsylvania, one to 9,972; Wisconsin, one to 12,042. These figures, of course, are not strictly comparable, especially when we consider the State of Ohio, which has a very large number of intelligent voluntary observers, on the one hand, and Kansas on the other, a State not thickly settled in all sections.

Another plan was to consider the area of destruction covered in all well-studied and destructive tornadoes, and then apply that area by weight to all violent storms of each State. The following table shows the relative numbers: Alabama, one square mile of devastation or severe destruction to each 480,600 square miles; Arkansas, one to 712,800; Georgia, one to 504,000; Illinois, one to 185,400; Indiana, one to 330,000; Iowa, one to 432,000; Kansas, one to 436,500; Michigan, one to 914,400; Missouri, one to 406,800; Ohio, one to 243,000; Pennsylvania, one to 468,000; Wisconsin, one to 475,900. These results are materially different from those first given, and they appear more satisfactory. Such methods of comparing destroyed with undestroyed areas are of course, incomplete and must be received with caution.

It appears from these data that in no State may a destructive tornado be expected oftener, on an average, than once in two years, and that the area over which the total destruction can be expected is exceedingly small even in States most liable to these violent storms. Professor Hazen's figures regarding the relation of destruction by fire to that of tornadoes are interesting, and worthy of consideration. The Chief Signal Officer believes this matter of great public importance, and desires to impress upon the people at large how small are the chances of personal injury or loss of property in this connection.

It is well settled, however, that in the last eighteen years the annual death casualties from tornadoes average 102 annually. While this is a large number, yet it does not appear to be as great as the death casualty from lightning, since during the present year, from March to August, inclusive, there were 102 lives lost by lightning; and in compiling this record the list is incomplete, especially as regards the Southern States. It may be safely assumed that, dangerous as are tornadoes, they are not so destructive to life as thunder-storms.

ST. LOUIS, July 8, 1891.

A. L. MCRAE, ESQ., *Observer Signal Service, Columbia, Mo.:*

DEAR SIR—I send you herewith some statistics of lightning damages for Missouri, taken from my work entitled "Deaths and Destruction by Lightning in the United States," covering the period of from January 1, 1883, to January 1, 1888:

Total number of persons killed	79
Total number of persons injured	181
Total amount of property loss	$214,549
During the above period of five years, covering the United States, the total losses aggregated the sum of	11,749,946
The total number of persons killed were	1,030
The total number of persons injured were	2,592
The total number of animals killed were	4,886
The total number of buildings and objects struck by lightning	7,116

The largest number of any certain class of buildings struck are dwellings, of which my record shows 1,634. The heaviest property loss on any certain class of buildings is upon barns, granaries and buildings of that class, which aggregate $3,119,055. The smallest losses sustained on any class of buildings are upon newspaper offices, of which there were only eight struck, with a total loss of only $35.

The heaviest damage done by lightning is in the Middle States, the lightest in the Rocky mountains and Pacific coast States and Territories.

Yours truly,

H. F. KRETZER.

INSTRUCTIONS TO WEATHER OBSERVERS.

LEVI CHUBBUCK, *Secretary State Board of Agriculture and Director State Weather Service, Columbia, Mo.:*

DEAR SIR—Complying with your request, I submit the following paper:

Many persons are deterred from co-operation with a weather service by the idea that an expensive outfit of instruments is needed in order to secure results of value. While this is true in a weather service which aims to deal with our larger storms and cold waves, it is by no means true in a local weather service.

Valuable observations may be made without any instruments whatever. An observer who for fifteen or twenty years has recorded the time of flowering of the more common fruit trees, the time of corn planting, the dates of early and late frosts, has secured more valuable data than one who has made the most complete instrumental observations for a year.

OBSERVATIONS OF PHENOMENA.

The dates when the common trees are first in bloom and the dates when each kind, as the apple or peach, is in full bloom should be recorded. The dates of the earliest white frosts in autumn and the latest in spring should be noted, together with a statement of the extent of damage done; the kind of vegetation affected should be stated. The date in autumn when the air temperature first falls to the freezing point of water, and the date in spring when this temperature is last reached, should be recorded. This can only be recorded by means of a thermometer which has been tested by immersing it in melting ice. Many ordinary thermometers read one ort wo degrees too high, as may be seen by making this test. There are other observations connected with rain-storms which are of the greatest value, which can be made with no other instrument than the clock, which should always be kept on time as accurately as possible. The source from which you derive time should always be stated, and the possible error of the clock should be given. When an approaching storm is seen in the horizon, the direction of the cloud and time should be noted, with the direction and estimated velocity of the wind. If the storm passes to the north or south, the angular elevation of the cloud-edge nearest you should be given, with wind direction and time. If the storm visits the station of the observer, the time when the cloud-front is directly overhead should be given, and the direction of the wind and cloud at that moment should be stated. The time when the rain begins should also be given. Slow veering of the wind during the storm should be noted by giving its direction at definite times, and the time of sudden changes of direction or velocity should be noted. The times when thunder begins, becomes most violent and ceases, should also be given, with any other phenomena which may serve to show the character of the storm.

It is impossible to exaggerate the meteorological value of accurate observations of this kind made in each county of a State. They enable the director to chart each storm upon the map of the State. The outline of the cloud front at each consecutive hour may be drawn, and the development of the storm and its progressive march may be thus readily determined. Observations made by observers at the edge of the storm are fully as valuable as those at the place of the greatest violence.

Rain-fall.—This is the most important of the observations in a local service. The rain-fall is measured by means of a rain-gauge, of which many forms are in use. It is very desirable to secure uniformity in the construction of rain-gauges. The simplest form of gauge is a cylinder of uniform diameter not less than three inches, and having a depth of one foot. The cylinder is mounted firmly in a vertical position. The depth of the water collected in the gauge is found by dipping a slender rod or scale into the water, observing the wetted height.

The gauge is often made having an opening ten times the area of the cylinder in which the water is collected. An inch of rain-fall will then stand ten inches deep in the collector. The Signal Service standard gauge has a collecting rim of brass 8 inches in diameter, beveled to a sharp edge. This rim is soldered to a galvanized iron funnel. The receiver tube is of seamless brass No. 16, the inside diameter being 2.53 inches and 20 inches deep. The whole instrument is 2 feet in height. The measuring stick is of seasoned cedar ½ inch wide and 3-32 inch thich, and is graduated to inches and subdivided in tenths and hundredths. The gauge is also provided with an outer tube for overflow, so that the filling of the gauge is prevented.

The proper exposure of the rain-gauge is a matter of great importance. It should never be placed upon the roof of a small building which is exposed to the wind. The building acts as an obstacle over and around which the wind sweeps with an increased velocity, drifting rain which should fall upon the building to the leeward of the building in an irregular manner. Gauges on different parts of such roof will show differences of from 25 to 50 per cent from each other. An admirable exposure for a gauge is in the center of an open clearing in a forest with underbrush where snow never drifts. Such an exposure can be imitated by planting a hedge of evergreens around a gauge. Such a shield checks the air current, without deflecting it in such manner as to form drifting eddies.

Gauges as ordinarily exposed at the surface of the ground lose some rain which they should collect, by reason of the drifting effect of wind which sweeps up over their tops, as in case of any other obstacle.

Snow-fall.—The rain-gauge does not collect snow-fall properly, for the reason that the drifting effects of wind are much more marked than in case of rain. The true snow fall is determined as follows: A smooth board should be placed with its surface flush with the ground at a place where snow does not drift. The depth of the snow is measured by the inch measure. The melted snow is then determined by inverting the gauge over the board and thrusting it down upon the board so as to imprison a cylinder of snow within. A sheet of tin is then thrust under the mouth of the gauge, which is then raised and carried into a warm room, and the snow is melted. The resultingwater is measured as in the case of rain.

When a rain or snow, noted in the column of phenomena, is inappreciable in amount, it should be expressly indicated. It is not enough to leave the record of the amount blank, as this might be the result of neglect to observe, or a failure to copy the amount.

Temperature.—The best instruments for the determination of temperature are the maximum and minimum thermometers. These instruments are somewhat more expensive than a good thermometer, but they give results of a much more complete and valuable character, and the readings require less time. Moreover, it is not necessary to read them at a definite time, as is the case with the common thermometer.

The maximum thermometer records the highest temperature of the day, which is ordinarily reached at about 2 o'clock p. m. The reading may generally be taken at any time during the forenoon or evening. The minimum thermometer registers the lowest temperature of the night, which usually occurs shortly before sunrise; and this may also ordinarily be read at any time during the forenoon or evening, unless a change of weather should threaten to show a lower temperature in the afternoon than had occurred during the previous night.

The maximum thermometer differs from the ordinary mercury thermometer, in having a narrow place in its bore, through which the mercury is forced by expansion of the mercury in the bulb. When the temperature falls, the mercury in the tube, above the narrow part of the tube, remains in position, and the reading of the top of the column is the highest temperature reached. The thermometer is mounted on a metal scale, and is placed in a nearly horizontal position. The mercury is forced back into the bulb by whirling it round a pivot near the top of the scale, when it is ready for a new reading.

The minimum thermometer is usually an alcohol thermometer, of rather wide bore. Within the tube and inside the liquid is a slender cylindrical index of glass with rounded ends, somewhat enlarged like the head of a pin. When the temperature falls, the surface of the column of alcohol moves toward the bulb, and pushes the index before it. When the temporature again rises, the liquid flows past the index, leaving it with its upper extremity at the lowest point reached by the surface. This instrument is also mounted in a horizontal position. The instrument is set for a new-reading by tilting up the bulb end, and allowing the index to slide to the surface of the alcohol column.

These readings, the maximum and minimum of each day, are very important in a study of the effects of temperature on vegetation. The mean of these two temperatures is, on the average, almost exactly the same as the mean temperature of the day, obtained by taking hourly readings. The difference between maximum and minimum readings is called the daily range of temperature.

Day.	Min.	Max.	Mean.	Range.
1	14.2	20.7	17.45	6.5
2	30.1	40.1	35.10	10.0
3	25.0	31.4	28.20	6 4
4	4.3	15.2	9.75	10.9
5	— 9.1	2.1	— 3.50	11.2
6	—16.4	— 1.5	— 8.95	14.9
7	— 2.0	9.0	3.50	11.0
8	8.3	19 3	13.80	11.0
9	9.2	25.9	17.55	16.7
10	15.1	30.1	22.60	15.0
Sums	78.7	192.3	135.50	113.6
Means	7.87	19.23	13.55	11.36

The above table shows how the records are made and reduced for a period of ten days. The monthly reduction is, of course, made in a similar manner. On three days of this period the temperatures are below zero. On the sixth, the highest temperature of the day was below zero; while on the fifth and sixth the mean temperature of the day was below zero. If the minimum and maximum have like signs, either + or —, the mean temperature is the mean of the two readings, and will have the same sign as those readings. If they have unlike signs, as on the fifth and seventh, subtract the smaller numerical reading from the larger, divide the difference by two, giving the resulting mean the same sign as the larger reading.

To find the average minimum for the interval covered by the observations, add all the + readings together, and subtract from this sum the sum of all the — readings. This will be the resulting sum. Divide this sum by the number of days. The average maximum, the average daily mean and the average daily range are found in like manner.

If no error has been made in the reductions, the mean of the average minimum and the average maximum will be the average mean. In the example, 7.87 is the average of the column headed "min.," and 19.23 and 13.55 are the means of the columns headed "max." and "mean." It will then follow that 13.55 must be the mean of 7.87 and 19.23. Similarly, the difference between 7.87 and 19.23 is 11.36, the average of the final column. In this way the observer can make an absolute check on his reductions; and no weather report is worthy of confidence which does not satisfy this check. The reductions should always be made on loose paper. If errors are detected, by a failure of the results to check, the work should be gone over until all errors are removed. Then the correct results should be entered in the journal of the observer and in the monthly report. This method will prevent the disfigurement of the report by erasures and by changing of figures, which often makes it impossible for the central office to determine what the entry was finally intended to be.

F. E. NIPHER.

Washington University, St. Louis.

From the Instructions to Voluntary Observers of the Signal Service.

[By H. A. HAZEN, in report to C. S. O., 1886.]

INTRODUCTION.

The science of the weather is becoming more and more largely developed, and is to-day attracting thousands who are anxious to learn the meaning of signs and to forecast the weather in the immediate future. It is a science of which it is easy for young or old to become votaries, and every town of any size has its weather-wise. There are to-day many sayings of doubtful value as regards the effect of the moon, the present length of the seasons as compared with former times, the amount of rain, the depth of snow, etc., which can be checked only by long-continued and careful observations. Take the matter of rainfall alone, which is of such prime importance to the farmer. The observation and record of rain is one of the easiest that can be made, and it would be of great value if we had stations 20 miles apart over the whole farming country; but, as it is, stations are about 40 miles apart, and large areas are entirely uncovered. Several of the more important observations, such as of temperature, rain, wind, thunder-storms, frosts, etc., are very simple indeed, and may be taken even by a child. It is the object of this book to give a few simple directions which will enable any one to make weather observations, to become an authority among his neighbors, and, at the same time, to aid the determination of the distribution of temperature, rain, thunder-storms, frosts, etc., as it is now being carried on at the central office of the United States Signal Service in Washington City.

GENERAL CONSIDERATIONS.

In meteorological observations, there are a few important considerations to be well borne in mind and to be studied before we come to the actual work of observation. Too often in the past a neglect of these fundamental considerations has led to serious errors in observations, especially of the wind, and less frequently of temperature. It is well known that on clear nights, owing to intense radiation from the sod, its temperature is frequently lowered 15 or 20 degrees below that of the air immediately above it. This cooling of the air increases its density, and, if on a side hill, it begins flowing down to the foot of the declivity. As a result, the cooler air fills up the valley at the foot, and as this is sheltered from almost all wind effects, the air within becomes much cooler than the general air about. Now, as the temperature we seek is that of a somewhat extended region unaffected directly or indirectly by harmful radiation or reflection, it is evident that this condition can be fulfilled only by an exposure of the thermometer on a knoll, or at least away from a valley. Actual observation has indicated a temperature in a valley 15 to 20 degrees lower than that of the general air. In one instance a temperature at Washington was found 10 degrees lower in a valley than on a knoll 100 feet away. It is clear that no amount of expense for the immediate sheltering of a thermometer would obviate this difficulty, which is fundamental. The question of correct wind-direction and velocity depends, still more than that of temperature, on the surroundings of a station of observation. In this case we must expand our view, and take in the country for miles around. It is clear that no satisfactory observations of wind can be made in a valley, on a hillside, or in any situation where there are many hills around. If in locating a station it is found impracticable to avoid difficulty in this direction, then the observer should be cautioned against relying upon any local wind-vane, but should try to obtain the direction by the movement of smoke, a flag, or any other contrivance upon a neighboring eminence. As far as practicable, standard instruments should be used, and their accuracy determined by comparison with regular standards.

TEMPERATURE.

The words heat and cold express sensations familiar to every one, and need no explanation. The latter is simply the absence of heat and not a mode of energy. These sensations are largely dependent upon the state of our bodies, and hence we are forced to adopt some invariable instrumental means for determining actual values. Since heat expands most bodies, and its withdrawal contracts them, by suitable means we might construct a heat measurer of some metal; or, better still, by the union of two strips of metal of different expansive coefficients, such as iron and brass. The art of making such heat indicators has been wonderfully perfected in these later days, and very accurate instruments are being made upon these principles. There is one serious defect, however, in all such contrivances, and that is their liability to change their indications in the lapse of time.

Since the volume of a gas or liquid would be changed by the application of heat, if we had some ready means of measuring this change of volume we would have a good measurer of temperature. Such an instrument is a gas or liquid thermometer in contradistinction to the one just described, which is a metallic thermometer. The gas or liquid thermometer consists of a bulb of some size, communicating with a tube more or less capillary, in which the length of the column of gas or liquid is dependent upon the temperature of the bulb, hence affording an easy means of measuring changes of volume or temperature in the latter. The gas usually used is dry air, and the liquid either mercury or alcohol. The air thermometer is of great importance in obtaining a standard of thermometry, but is seldom used outside the laboratory.

THERMOMETER SCALES.

The two scales in common use are the Fahrenheit and the Centigrade. The former has its freezing point at 32° and boiling point 212°. These are the fixed points of a standard thermometer, the first being the temperature of melting ice and the second that of boiling water. In the Centigrade scale these points are fixed at 0° and 100°. Since the interval between the two fixed points in the Fahrenheit scale is 180°, and in the Centigrade scale 100°, it follows that 1.8° Fah. is equal to 1° Cent. To change the Centigrade degrees to Fahrenheit, it is necessary to first multiply by nine-fifths and then to add 32°. In the reverse operation we must subtract from the Fahrenheit degrees 32°, then multiply by five-ninths. In other words—

$$F = \tfrac{9}{5}\,C + 32^\circ \qquad\qquad C = \tfrac{5}{9}\,(F - 32^\circ)$$

Example: Convert 50° F to C. we have :

$$\tfrac{5}{9}\,(50 - 32) = 10^\circ\text{; hence } 50^\circ\,F = 10^\circ\,C$$

DESIGN FOR THERMOMETER SHELTER.

The frame to be cubical, 3½ feet long, 3 feet wide, and 3 feet high, of 2-inch pine, the corners to have 11 to 13 square inches cross-section. The top and bottom rails to be 2 by 3 inches. The bottom to be close, of ⅝-inch pine. The roof to be double, of tongue and groove boards, joints white leaded, sloping 8 inches from front to rear, with 6 inches between the roofs; the inner of ⅝-inch, the outer of ⅞-inch pine. The front to have a door 15 inches wide, the length of the side, and to open down in front. The sides to be of blind work, the slats of white pine, 3½ inches wide and ¼-inch thick, to slope at an angle of 45 degrees to the horizontal. The distance from center to center to be 1½ inch. Each slat to have a strip ½-inch wide and ¼-inch thick nailed along its length on the inside, flush with the bottom. The frame to be made in four parts, and to be furnished with screws for putting together. The bottom to have one piece loose and hinged, so as to allow of dropping down, and a button to hold it up. Inside to have a frame for supporting the thermometers, consisting of two upright strips, 1 by 3 inches, fastened to long strips screwed to the right and left rails of the frame, with a strip 1 by 2½ inches between those for the thermometers. The inside to have one good coat of white paint and the outside two coats. The wood to be well seasoned.

SELF-REGISTERING THERMOMETERS.

The use of maximum and minimum thermometers is very important, as it enables us to determine not only the highest and lowest temperature each day, but the mean of these two temperatures also gives nearly (not more than .2° to .4° above) the monthly mean temperature. The maximum thermometer, as commonly used in this country, consists of an ordinary instrument, with its stem constricted near the bulb. This thermometer is placed in a position slightly inclined toward the bulb; while the constriction readily allows the mercury to pass with a rising temperature, yet it prevents all passage back to the bulb. The end of the column then indicates the highest temperature experienced during the twenty-four hours. In setting this thermometer for an observation it should be allowed to hang vertical, when a single stroke from the pin will cause the mercury to drop into the bulb. If this does not occur, then the instrument must be grasped at its point of suspension, and twirled rapidly. Care should be taken to see that the screw holding the thermometer upon the post is sufficiently tight to prevent the thermometer striking the board or any other projection near it.

The minimum thermometer should be hung nearly horizontal, and should be set by tipping up the bulb end till the index reaches the end of the column. The end of the index nearest the end of the alcohol column is the one to be read. Care must be taken not to bring the hand near the bulbs of either the maximum or minimum thermometers in setting them. A comparison between the end of the alcohol column and the temperature of the dry-bulb should be made at the end of each month, and entered on the record. The same may be done in the case of the maximum: that is, set the maximum and then compare, or else read both maximum and dry-bulb when the column is rising in both, and record the comparison.

READING INSTRUMENTS.

In reading any and all instruments, whether thermometers or barometers, it is essential to bring the eye so that the line from the eye to the end of the column shall be horizontal. This is most important in case the thermometer is graduated only on the brass scale behind the tube, as a little variation in the position of the eye, above or below the line of graduation, will make a large difference in the reading. A little care should be taken in the reading to note exactly the number of degrees that the thermometer indicates. It has been found that frequently errors of 5° creep in from a want of care in this respect. A little practice will enable any one to split the degree into tenths: *i. e.*, to regard the space as divided into ten equal parts, and to take the nearest tenth that the instrument indicates for record.

THERMOMETER EXPOSURE.

Suggestions have already been given as to the proper place, in any region, where exposure should be made in order to obtain general conditions over the region. Second in importance is the question of the immediate environment of the thermometer which shall be most likely to give the true air temperature. This question has been most carefully investigated, and the following suggestions are made for the guidance of all concerned:

(1) The most important consideration is as full and free natural ventilation as is possible. This is essential, even if an artificial ventilation be employed for the dry and wet bulbs. Since the maximum and minimum temperatures are necessarily unventilated, the shelter itself should give accurate results for these.

(2) Provision should be made to avoid effects of direct solar radiation, and also of heat reflected and radiated from surrounding objects.

(3) Rain should be excluded, but only, as far as possible, in connection with (1). During a rain-storm the dry and wet bulbs must necessarily give the same values, the air being saturated; hence a wetting at this time is not harmful.

(4) All permanent heating effects from warm walls, chimneys, etc. should be carefully avoided.

ERRORS OF ALCOHOL THERMOMETERS.

There are usually used alcohol thermometers for determining the lowest temperature of the night. These are succeptible to errors which often seriously affect their readings. This thermometer has usually for its liquid alcohol, in which there floats a glass index, which is carried down to the lowest point reached during the night by the capillary action of the end of the column and left there, the alcohol passing by the index as the temperature rises in the morning. Owing to the volatile nature of the fluid, it is frequently evaporated and condensed at the upper part of the tube, thus causing a too low reading. In transportation, also, the column is often broken into a large number of parts. To unite the column, pass a small copper wire several times through the hole at the end of the brass scale, thus forming a loop. To this tie a strong string, a foot or so long, and rapidly swing the thermometer through a circle the radius of the string; continue the swinging until the operation is complete. Where the column is very badly broken it may be reunited by heating the bulb in water, gradually made hotter by adding hot water, until the end of the unbroken column reaches the expansion chamber at the top; if now the bulb is gradually cooled with the tube held vertically, bulb down, it will be found that there is a complete column. Another error sometimes occurs rendering the thermometer unserviceable, in that the index is stopped in the tube by some irregularity in the bore. If this occur often the thermometer will have to be returned to the maker.

PRECIPITATION.

A knowledge of the rain and snow-fall of any locality is of great importance to the farmer, and each one should have a rain-gauge. By its use the gardener will be guided in determining the amount of moisture needed by his plants. The health and increase of domestic animals, the value of the crops, as well as the labors of the farmer, are dependent on the excess or deficiency of rain. Statistics of rain-fall are very frequently called for in connection with crop production, sanitary arrangements in any town, and engineer operations, especially in the line of water supply. The hydraulic engineer must determine the rainfall in order to provide against floods in rivers and drouths on land. The observation of rain is one of the simplest imaginable, though one of the most difficult to make an estimate on. Some observers have sent in an estimate of 10 inches in a single storm; this is impossible, except in very rare cases of cloud-bursts. No estimates of rain-fall should ever be recorded, but if an observer has no means of measuring rain, the record should be light (lt.), heavy (hy.), or very heavy (v.hy.). If one has no regular gauge, a pail with nearly vertical sides, a tub or a simple tomato can should be used. An ordinary foot-rule or a yard-stick will measure the depth of rain after it has been caught. The following is a description of the rain-gauge used by the Signal Service. In the latest pattern adopted the edge of the receiver is very carefully turned from brass, and the cylindrical reservoir is of drawn brass tubing, which makes the gauge very accurate.

RAIN-GAUGE.

The rain-guage adopted for Signal Service stations consists of a funnel-shaped receiver, surmounted by a cylinder 1½ inches in length and 8 inches in diameter. The funnel is placed in a cylindrical reservoir 2.53 inches in diameter and 20 inches in height. The area of the cross-section of the reservoir is to that of the receiver as one to ten, or 1 inch of rain falling in the receiver corresponds with ten inches of water in the gauge. The amount of rain-fall collected in the gauge is measured by means of a graduated rod on which are marked inches and tenths of inches; 1 inch (10 spaces) on the rod corresponds to 0.1 (0.10) of an inch of rain, and 0.1 of an inch (1 space) on the rod to 0.01 of an inch of rain. To provide for very heavy rain-falls the gauge is placed within an outer galvanized iron cylinder 6 inches in diameter and 23½ inches in height, and an opening is made in the top of the small cylinder of the gauge at the height of 20 inches. The gauge will then receive 2 inches (200 spaces, or 20 lineal inches on the rod) of rain-fall, and when more than this falls the excess will flow over into the attached cylinder. To ascertain the amount of rain when it is in excess of 2 inches, first note the 2 inches in the small cylinder, then empty it, and pour into it the water in the outer cylinder; measure the amount, as already directed, add it to the 2 inches poured from the small cylinder, and the sum will be the total amount of rain-fall.

In measuring the rain-fall, as the inside reservoir has one-tenth the area of the receiver, the number of inches of water should be counted as tenths. Sometimes the measuring stick becomes slightly oily, and in consequence the line of water will not be clearly marked; in such case draw the stick through the hand once or twice, and when again dipped in the water there will be found a very clear and well-defined line of demarkation.

In many cases observers have had a gauge, similar to the above in size and shape, made from tin by a tinsmith, and afterward painted. Care should be taken in exposing the gauge to have it only 1 to 2 feet above a level plane, and at least the distance of twice the height of an object from it.

SNOW.

In measuring snow, the best way in many cases is to take the outside overflow attachment and press it, mouth down, into new-fallen snow where it has not drifted; then by passing a thin shingle at the bottom of the snow, a cylinder of it, the size of the overflow, may be taken up, melted, and measured as melted snow. In melting snow, the best way is to press the bottom of the gauge into a pail of rather hot water, and keeping it there till the snow has entirely melted. Care should be taken in all cases to enter the amount of snow unmelted in its appropriate column. The above method of obtaining melted snow is quite tedious, and the following will do nearly as well, and even better if there is much drifting: Select a level plane of some extent, and carefully measure the depth of freshly-fallen snow in at least three places where it has not drifted. If the three measurements nearly agree their mean will give the snow-fall, and one-eleventh or one-tenth, according as the snow is light or heavy, will give an approximate value for the melted snow. If snow heavier than 10 inches to the inch of water falls, it can almost invariably be measured in the rain-gauge, as it must be almost melting, or at least not easily blown out of the gauge.

Most difficulty will be experienced in noting precipitation when rain changes to snow, or *vice versa*. In the first case care should be taken to measure the rain and snow in the gauge as soon as it is found that the snow is being blown out or has filled the receiver, and after that only the snow should be measured, being careful not to measure any of the snow twice. The same precautions are needed when the reverse takes place, namely, snow turning to rain. This is a very difficult matter to give rigid rules upon, and each observer must depend largely upon his judgment in each individual case. The fall of rain or snow should be measured at the end of the storm, and a careful note of time should be made of the beginning and ending of the rain. In many cases it would be very interesting to have the time of beginning and ending of the heaviest rain.

CLOUDS.

The study of the forms and movements of clouds is of great importance in meteorology, for they afford the only means of knowing what changes are in progress in any part of the atmosphere above the lowest stratum. The very existence of a cloud, at any elevation, shows that the atmosphere is there in a state of saturation, and the lower the cloud the more humid is the atmosphere. The forms of the clouds may give information as to the changes of temperature and the cause of these changes, and their movements show what winds are blowing high up in the atmosphere, and even the rate of their movement. If the height of the clouds is measured, they serve as an accurate wind-vane and anemometer.

Cloud observations include their quantity, form and movement.

Cloud proportion.—The proportion of the sky covered by clouds may be determined by simple inspection. A sky wholly overcast is recorded as 10, and all minor degrees of cloudiness by the lower numbers, 0 being used to indicate less than one-twentieth of cloudiness. Of course, only an approximate estimate is possible, but with a little practice this may be made sufficiently accurate for practical requirements. It may assist beginners in making this estimate, to notice that if the sky be divided into five triangular segments by five equidistant lines drawm from the zenith to the horizon, each of these will be divided into two nearly equal parts by a line parallel with the horizon, and at one third the distance between it and the zenith.

CLASSIFICATION OF CLOUDS.

The most important are the three primary forms, cirrus, cumulus and stratus, and the combinations cirro-cumulus, cirro-stratus, cumulo-stratus and nimbus.

Cirrus.—Clouds composed of loose, parallel or divergent fibers, looking like hair or feathers, but varying greatly in form. It is a very lofty cloud, sometimes attaining the height of 10 miles. It is usually of very small density. and is probably composed of minute snow crystals, because the phenomena of halos are produced by them, which can only be explained by the refraction of the rays of light through ice crystals. The motions of the cirrus often differ in direction from those of the surface-winds, showing the general movements of the upper strata of the atmosphere, and are often indicative of coming changes.

Cumulus.—Convex or conical heaps increasing upward from a horizontal base. These are dense in structure and of a round or globular form, and are often called "cotton-bale." They are formed in the lower atmosphere and move with the current close to the earth. They are formed by ascending currents of warm air rising from the heated ground until, becoming cooled below the dew-point, it condenses into visible cloud. The rounded top results from the fact that an ascending current is stronger near its center than at its external parts and carries up the vapor to a greater height. In fair weather the cumulus often form a few hours after sunrise, go on increasing until the hottest part of the day, and generally disappear about sunset, though they may continue through the night. They sometimes take the form of rolls.

Stratus.—A widely-extended continuous horizontal sheet, increasing from below upward. This is generally a fine-weather cloud, appearing at night and morning of the brightest days. It is a layer or horizontal sheet of uniform thickness, appearing at a distance like a streak on the horizon. It generally forms about sunset, grows denser during the night, and vanishes at sunrise. It is caused by the vapors which have risen during the day, and which, as the ascending currents become weaker toward evening, approach the earth. As the cooling of the air during the night begins near the ground, and thence proceeds upward, the condensation of the vapor first appears near the ground, and thence increases from below upward as the successive layers of air become cooled below the dew-point. Descending smoke and dust contribute to the density of stratus clouds.

Cirro-cumulus.—Small, well-defined roundish masses in close horizontal arrangement or contract. This is also a high cloud, though usually at a lower level than the cirrus, from which it differs in being more globular in form, as it consists generally of small detached rounded masses, like a flock of sheep lying down. When at a low level it may be difficult to distinguish these clouds from small cumuli. It occurs very frequently in summer, particularly in dry and warm weather.

Cirro-stratus consists of delicate fibrous clouds spread out in strata, which are either horizontal or but slightly inclined to the horizon. This cloud appears to result from the subsidence of the fibers of the cirrus to a lower level. Sometimes the whole sky is so mottled with this cloud as to resemble the back of a mackerel—"mackerel sky." The cirro-stratus precedes wind and rain, and is almost always to be seen in the intervals of storms. It should be noted that the term "mackerel sky" is applied to the cirro cumulus in England and other countries, and there indicates fine weather, but in the United States it is regarded a foul-weather cloud.

Cumulo-stratus.—This has for its base a horizontal layer or stratum from which rise large overhanging masses of cumulus. It is the cumulus changing into the nimbus.

Nimbus.—A cloud from which rain is falling. It is generally composed of different clouds which are so blended that it becomes impossible to distinguish them.

The term "scud" indicates loose, detached clouds drifting rapidly before the wind.

CLOUD MOVEMENT.

The great difficulty in getting at the true direction of cloud movement lies in the effect of perspective. The following device eliminates this:

"Set up a pointed pole, reaching 6 or 8 feet above the observer's head, and through the top, an inch or so below the point, fix two stout cross-wires, or thin iron rods, set truly by compass to the four cardinal points. The space around the pole must be sufficiently open to allow of a good view of the sky in all directions. Let the observer then station himself at such a distance from the pole, and in such a position, that some recognizable limb of a cloud appears to move vertically upward from the top of the pole or vertically downward toward it. The direction of the pole from the observer's position (which may be judged of accurately by means of the cross-wires on the top) is the direction of the cloud's true movement. With a little care in selecting the position the pole may be dispensed with, as any pointed object will serve the purpose, provided the observer has previously acquainted himself accurately with the points of the compass. The velocity of cloud movement may be measured in favorable situations by observing the time that the shadow takes to traverse a certain space of country, the extent of which is accurately known."

The direction from which the clouds are moving should be recorded to eight points—N. NE., E., etc. The velocity may be recorded by the letters s, slowly, and r, rapidly, placed as an exponent to the direction: thus, N^r, S^s.

Haze, smoke and fog should be recorded as such, with the addition of the words "light" or "dense," as the case may be.

STATE OF THE WEATHER.

Cloudless, when the sky is $\frac{3}{10}$ or less obscured; partly cloudy, when the sky is from $\frac{4}{10}$ to $\frac{7}{10}$ obscured; cloudy, when the sky is more than $\frac{7}{10}$ obscured; light rain (lt. r.), when there is light rain; heavy rain (hy. r.), when there is heavy rain; in like manner with light and heavy snow, substituting s for r; fog, haze, smoke, according as these are predominant.

FROST.

Occurrence of first and last frost of any growing season should be specially noted, as well as all killing frosts during the same.

CORONÆ.

These must be distinguished from halos. Coronæ are very common, especially around the moon, and are produced by the rays passing through a thin layer of cloud. Sometimes as many as three small concentric circles may be seen whose diameters are in the ratio of 1:2:3. They are frequently colored, red being the outside color. These colors are not the pure colors of the spectrum, but rather those of the opal, and are caused by interference and not refraction. A solar corona is not often visible, on account of the dazzling brightness of the sun, but it may often be seen by viewing the sun through colored glass or noticing the reflection in the water.

Halos are large circles of 45° or 92° in diameter. That is, the diameter is equal to one-eighth or one-fourth the circumference of the horizon. Both are seldom seen at the same time. The colors are very feeble, generally approaching whiteness. Halos arise from the presence in the atmosphere of minute prisms of ice, and consist of refracted light. Somtimes the halo is intensified into two bright spots, one on each side of the central luminary. These are called "parhelia" or "paraselenæ" (mock suns or mock moons). Still more complicated phenomena are sometimes seen, though rarely, except in high latitudes,

THUNDER-STORMS.

Thunder-storms six hours apart may be taken as separate storms.

Upon the occurrence of thunder, give as nearly as possible the time of first, loudest, and duration of thunder (being careful to note a.m. or p.m. if the hours 0 to 24 are not used). Frequently when a storm has passed there will be muttering of thunder, but a little observation will show when a storm has really passed.

Give the direction from which the storm appears to be coming, as shown by threatening sky, lightning flashes, or thunder peals. Also, the direction toward which it goes.

It is proposed to attempt the use of a scale to indicate the approximate intensity of the storm. This is confessedly a very difficult matter to decide upon, but it is much needed in order to have a means of comparison of storms in future, and the following is suggested for trial:

1. Distant lightning (the number is not needed in this case).
2. Distant thunder.

3. Moderate thunder-storm.

4. Heavy thunder-storm.

5. Heavy thunder, with very high wind breaking small branches of trees, etc.

6. Thunder with hurricane or tornado.

TORNADOES AND LAND-SPOUTS.

These whirlwinds, or violent and circumscribed storms, give rise to very complex phenomena, which are difficult to observe. All the meteorological circumstances, however, should be minutely noted; among others the following:

The course of the barometer, which almost always sinks much and rapidly; that of the thermometer, which usually indicates an elevation of temperature; the region of the heavens in which the thunder-storm frequently accompanying them is formed; the form and color of the clouds; the direction and intensity of the wind; the frequency, size and form of the lightning; finally, the apparent shape of the land spout, its variations, its course, and its effects upon the trees and upon the ground.

ADDITIONAL OBSERVATIONS DURING STORMS.

Everybody knows the importance of a knowledge of the laws of those great movements of the atmosphere which embrace almost the whole extent of the continent. It is only in following them step by step, by observing their different phases at different places, and by combining the facts obtained, that the meteorologist can be enabled to discover the laws which preside over these great phenomenæ. For this, the three regular observations a day are insufficient; it is then earnestly recommended to observers who desire to contribute effectually to the solution of this great problem, not to content themselves with the prescribed number, but to add as many more as possible during the continuance of remarkable storms, noting not only the state of the instruments from hour to hour, if possible, but following with attention all the meteorological changes. These observations must be entered on the reverse of the sheet, under the head of "Casual Phenomenæ," which is particularly reserved for this purpose.

The principal points to which attention should be directed are the following:

The barometer announces, by a considerable fall, the approach of a storm. Then it begins to rise during its continuance, and only resumes its normal equilibrium after its close. Note especially the following points:

Was the storm preceded by a noticeable or sudden rise previous to the fall?

Note the state of the barometer, and the time when the fall becomes more rapid.

Its state, and the time, when it is lowest and when the rise begins.

The highest point which it reaches during or immediately after the storm.

If alternations of rising and falling take place, the fact should be mentioned and the time noted.

The thermometer.—The fluctuations of the thermometer in the same time as those of the barometer should also be noted, and their connection with the changes of the wind be observed.

The wind.—It is of the greatest importance to observe the course of the winds through the entire height of the atmosphere during the whole continuance of the storm, by means of the wind-vane and of the clouds in the different layers of the atmosphere.

The hour when the wind begins, and the direction whence it comes;

The moment of its greatest violence;

The instant it changes its direction, and when it takes the direction it keeps to the end of the storm.

It should be stated if the wind blows in a continuous manner or in squalls, and what is its force.

If there should be one or more moments of calm, the hour and duration will be indicated.

Great care must be taken at each observation to note also the direction of the different layers of clouds, which will very often be found different from that of the wind below, for the whole duration of the storm.

The clouds.—Are there certain forms of clouds which announce the approach of a storm? It is necessary, in this connection, to watch the formation of the cirrus, the cirro-cumulus, cirro-stratus, their arrangement in parallel lines, their course, and their direction. Note the quarter of the sky first covered with clouds; the moment when it is entirely covered; if there are later clear spots or not; the moment when the sky clears off.

The rain.—Note the hour at which the rain or the snow begins and ends; measure the quantity fallen while the storm lasts.

INSTRUCTIONS FOR OBSERVING AURORAS.

Though the aurora borealis has received attention during a considerable portion of the last two centuries, definite information is still wanting on several points which may serve as the basis of a sound induction as to its cause. These relate particularly to the actual frequency of its appearance; its comparative frequency in the different months of the year and different hours of the day; the connection of its appearance with other atmospherical phenomena; the elevation and extent of visibility of the arch; and whether the same or different phases are presented to individuals at different stations at the same moment of time; finally, the precise influence of the arches, streamers, etc., on the magnetic condition of the earth; and whether any unusual electrical effects can be observed during the appearance of the meteor.

Auroral phenomena may be divided into the following classes:

1. A faint light in the north, without definite form or boundary.
2. A diffused light, defined by an arch below.
3. Floating patches of luminous haze—sometimes striated.
4. One or more arches, resembling the rainbow, of uniform white color, retaining the same apparent position for a considerable time, and varying in luminosity.
5. A dark segment appearing under the arch.
6. Beams, rays, streamers, waves, transverse and serpentine bands, interrupted or checkered arches, frequently tinged with color, and showing rapid changes in form, place and color.
7. Auroral corona, or a union of beams south of the zenith.
8. Dark clouds accompanying the diffuse light.
9. Sudden appearance of haze over the whole face of the sky.

The following may serve as a scale of brightness: (1) faint; (2) moderate; (3) bright; (4) very bright.

GENERAL DIRECTIONS.

1. Make a regular practice of looking for auroras every clear evening, from 8 to 10 o'clock or later. Record the result, whether there be an aurora or not.
2. Note the time of observation, and compare the watch used with a good clock, as soon after as is convenient.

GENERAL PHENOMENA OF CLIMATE.

Phenomena of a general character, of which the date of appearance cannot be mistaken, are very valuable. Series of years have in some cases been carefully observed, which would greatly add to the value of the current record, if forwarded with it. The following are of this class:

1. Breaking up of ice in large rivers or bays.

2. Date of greatest rise and lowest fall of water in large rivers, especially when periodic, as in parts of the interior.

3. General leafing and fall of leaf in deciduous forests. In most parts of the North and the interior, these are well marked and easily designated periods.

4. Beginning of growth and the end of growth or destruction of grasses in general, as on plains or prairies.

5. First growth, flowering and maturity of important annual staples, with their period in days from the beginning to the end of vital action.

Voluntary observers are requested to include in their monthly reports all reliable information relative to the destruction of life and property coming to their knowledge, classifying it, as far as possible, as indicated in the following table:

Date of storms.........	Nature of storms (tornado, northeast gale, etc.).................	Section of country traversed by storm........	Number and names of persons killed.........	Number and names of persons injured.......	Number and names of vessels lost or damaged, with estimated amount of loss.........	Number of houses, barns and other buildings destroyed or damaged, with estimated amount of loss.........	Estimated amount of damage to property....	Number of animals killed, and estimated value..........

INSTRUCTIONS FOR USE OF SLING PSYCHROMETER.

The whirling psychrometer affords at once the simplest and probably the most accurate means at general command for the determination not only of the true air temperature, but also of the amount of moisture contained therein. While the use of the instrument is attended with considerable risk as to its breakage, especially when in the hands of those not yet familiar with the "knack" of whirling it, yet many thousands of observations have been made with a single pair of thermometers without an accident, and the Chief Signal Officer, in supplying this very convenient and unavoidably delicate instrument, whose indications are so reliable and accurate, trusts that the trial now being made of furnishing scientific instruments of this character to intelligent observers will be met by due appreciation and special care on their part, and that it will be unnecessary to withdraw the instruments on account of unreasonable breakage. Observers, therefore, should make their first trials in learning to whirl the psychrometer by using some object as nearly as possible like the psychrometer in weight and dimensions. With a little practice one will quickly acquire the "trick" of whirling and stopping the psychrometer with perfect safety. The following instructions will serve for guidance in the proper use of the instrument:

EXPOSURE.

While the psychrometer will give quite accurate indications, even in the bright sunshine, yet observations so made are not without some error, and where greater accuracy is desired the psychrometer should be whirled in the shade of a building or tree, or, as may sometimes be necessary, under an umbrella. In all cases there should be perfectly free circulation of the air, and the observer should face the wind, whirling the psychrometer in front of his body. It is a good plan, while whirling, to step back and forth a few steps to further prevent the presence of the observer's body from giving rise to erroneous observations.

WHIRLING AND STOPPING THE PSYCHROMETER.

It is possible to effectually describe these movements. The arm is held with the forearm about horizontal and the hand well in front. A peculiar swing starts the thermometers whirling, and afterward the motion is kept up by only a slight but very regular action of the wrist, in harmony with the whirling thermometers. The rate should be a natural one, so as to be easily and regularly maintained. If too fast, or irregular, the thermometers may be jerked about in a violent and dangerous manner.

The stopping of the psychrometer, even at the very highest rates, can be perfectly accomplished in a single revolution when one has acquired the "knack." This is only acquired by practice, and consists of a quick swing of the forearm by which the hand also describes a circular path, and, as it were, follows after the thermometers in a peculiar manner that wholly overcomes their circular motion without the slightest shock or jerk. The thermometers may, without very great danger, be simply allowed to stop themselves; this will generally be quite jerky, but, unless the instrument is allowed to fall on the arm, or strike some object, no injury should result.

It is trusted observers will appreciate the excellence of this rather remarkable little instrument, and will drill themselves in its proper use.

THE WET BULB.

It is important that the muslin covering for wet bulb be kept in good condition. The evaporation of the water from the muslin leaves always in its meshes a small quantity of solid material, which sooner or later somewhat stiffens the muslin so that it does not readily take up water. This will be the case if the muslin does not readily become wet after being dipped in water. On this account it is desirable to use as pure water as possible, and also to renew the muslin from time to time. New muslin should always be washed to remove sizing, etc., before used. A small rectangular piece, wide enough to go about one and one-third times around the bulb, and long enough to cover the bulb and that part of the stem below the metal back, is cut out, thoroughly wetted in clean water, and neatly fitted around the thermometer. It is tied first around the bulb at the top, using a moderately strong thread. A loop of thread to form a knot is next placed around the bottom of the bulb, just where it begins to round off. As this knot is drawn tighter and tighter the thread slips off the rounded end of the bulb and neatly stretches the muslin covering with it, at the same time securing the latter at the bottom.

TO MAKE AN OBSERVATION.

The so-called wet bulb is thoroughly saturated with water by dipping it into a small cup or wide-mouthed bottle. The thermometers are then whirled rapidly for 15 or 20 seconds, stopped and quickly read, the wet bulb first. This reading is kept in mind, the psychrometer immediately whirled again and a second reading taken. This operation is repeated three or four times, or more, if necessary, until at least two successive readings of the wet bulb are found to agree very closely; thereby showing that it has reached its lowest temperature. A minute or more is generally required to secure the correct temperature.

When the air temperature is near freezing point it very often happens that the temperature of the wet bulb will fall several degrees below the freezing point, but the water will still remain in the liquid state. No error results from this, provided the minimum temperature is reached. If, however, as frequently happens, the water suddenly freezes, a large amount of heat is liberated, and the temperature of the wet bulb immediately becomes 32°. In such a case it is necessary to continue the whirling until the ice-covered bulb has reached a minimum temperature.

A. W. GREELY,
Chief Signal Officer.

INSTRUCTIONS IN THE USE OF THE TABLES

The first table will enable any one to obtain at sight the dew-point and relative humidity when the air and wet-bulb temperatures are given.

Example: Given $t=60^\circ$; $t'=51^\circ$; $t-t'=9$, with $t=60^\circ$ and $t-t'=9^\circ$, we find from the table A, dew-point=43° and relative humidity 53 per cent. If it be desired at a high station, with a pressure of, say 24″, to correct the above values, it may be done as follows: The vapor tension corresponding to 43° dew point is found from the second column to be .277″ and the correction to this by table B at 24″ is +.018″, hence the *v. t.* corrected for elevation is .295″; the dew-point corresponding to this *v. t.* is 44.5°; with this dew-point and air temperature 60° we find the relative humidity 56.5 per cent. At temperatures below 20° the nearest even tenth should be taken for $t-t'$ and between 20° and 80° the nearest .5° should be used.

ABSOLUTE HUMIDITY.

If any one desires to determine the absolute humidity in grains per cubic foot, he can do so by using table C. Enter the table with the dew-point, and the absolute humidity may be taken right out; for example, a dew-point of 43° shows 3.178 grains of moisture in each cubic foot, at the temperature of $t'=60$ and $t'=51^\circ$. It will be readily seen that when we have the dep-point given we virtually have also the vapor tention and absolute humidity; *i. e.*, at any station the form of the curve of the above three elements will be absolutely the same.

When we have lines of equal dew-point on a map of any region we have also those of equal vapor tension, and absolute humidity, or, in other words, a line of equal dew-points marked as 49° may be marked as equivalent to a vapor tension of .347″ and an absolute humidity of 3.937 grains.

CORRECTION OF BAROMETER READING TO 32°.

Table D.—Enter the table with the observed pressure and the temperature of the attached thermometer. For example, suppose we have given pressure 28.5″ and attached thermometer 73°, the correction would be —.113″; that, is, .113″ must be subtracted from the reading of the barometer to reduce it to freezing.

REDUCTION OF BAROMETER READINGS TO SEA-LEVEL.

Table E is to be used for this reduction. The following example will show its use: Suppose the height of the station is 670 feet, and the temperature of the outside air obtained from the dry-bulb thermometer at the time of the observation is 44°, then the reduction would be .737″ or .74″; this amount is to be added to the observed barometer reading to reduce it to sea-level. In using the table, observers should construct one in manuscript, after learning the height of the station; this should be carried out to every degree or every two degrees of air temperature for the height of the station as found in the left-hand column.

TABLE A.—*Dew-point and relative humidity.*

Air temperature	Vapor tension	Depression of the wet-bulb thermometer (t-t').																									
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0		2.2		2.4		2.6	
		Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
—40	.007	—61	67	....	35	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—39	.007	—58	68	....	36	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—38	.007	—56	69	—80	37	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—37	.007	—53	69	—76	39	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—36	.008	—51	70	—73	40	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—35	.008	—49	71	—69	42	....	13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—34	.008	—47	72	—65	44	....	16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—33	.009	—44	73	—62	46	....	19	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—32	.009	—41	74	—59	48	....	22	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—31	.009	—39	76	—56	51	....	26	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—30	.010	—36	77	—52	53	—75	29	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—29	.010	—34	78	—48	56	—69	33	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—28	.011	—33	79	—41	58	—64	36	....	14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—27	.011	—31	80	—41	60	—59	39	....	18	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—26	.012	—30	81	—37	62	—54	42	—78	22	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—25	.013	—29	82	—34	64	—49	45	—69	26	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—24	.013	—27	83	—32	66	—44	48	—62	30	....	13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—23	.014	—26	83	—30	67	—39	51	—56	34	..	17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—22	.015	—25	84	—29	68	—36	53	—51	37	—73	21	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—21	.016	—24	84	—27	70	—33	55	—43	39	—64	24	....	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....

—20	.017	—23	86	—26	71	—31	57	—40	42	—57	28	....	14	....	....	....	....	....	....	....	....	....	....	....	....	....	....
—19	.018	—22	86	—25	73	—29	59	—35	45	—5	32	—71	18	....	5	....	....	....	....	....	....	....	....	....	....	....	....
—18	.018	—21	87	—24	74	—27	61	—32	48	—43	35	—62	22	....	9	....	....	....	....	....	....	....	....	....	....	....	....
—17	.019	—20	88	—22	75	—26	63	—30	50	—37	38	—54	26	....	14	....	....	....	....	....	....	....	....	....	....	....	....
—16	.020	—18	88	—21	77	—24	65	—28	53	—33	41	—46	29	—67	18	...	6	....	....	....	....	....	....	....	....	....	....
—15	.022	—17	89	—20	78	—23	66	—26	55	—31	44	—40	32	—58	21	....	10	....	....	....	....	....	....	....	....	....	....
—14	.023	—16	89	—19	79	—22	68	—25	57	—29	46	—35	35	—49	25	—71	14	....	3	....	....	....	....	....	....	....	....
—13	.024	—15	90	—17	80	—20	69	—23	59	—27	49	—32	38	—41	28	—60	18	....	8	....	....	....	....	....	....	....	....
—12	.025	—14	90	—16	80	—19	71	—22	61	—25	51	—29	41	—35	31	—51	22	—74	12	....	2	....	....	....	....	....	....
—11	.026	—13	91	—15	81	—18	72	—20	62	—23	53	—27	44	—32	34	—42	25	—61	16	....	6	....	....	....	....	....	....
—10	.028	—12	91	—14	82	—16	73	—19	64	—22	55	—25	47	—29	38	—37	28	—51	19	—76	10	....	2	....	....	....	....
— 9	.029	—11	91	—13	83	—15	74	—17	65	—20	57	—23	49	—27	40	—32	30	—41	23	—61	14	....	6	....	....	....	....
— 8	.031	—10	92	—12	84	—14	75	—16	67	—19	59	—21	51	—25	42	—29	34	—35	26	—50	18	—74	10	....	2	....	....
— 7	.032	— 9	92	—10	84	—12	76	—15	68	—17	61	—20	53	—23	45	—26	37	—31	29	—40	21	—59	14	....	6	....	....
— 6	.034	— 8	93	— 9	85	—11	77	—13	70	—15	63	—18	55	—21	58	—24	40	—28	32	—34	25	—46	18	—69	10	..	2
— 5	.035	— 7	93	— 8	86	—10	78	—12	71	—14	64	—16	57	—19	50	—22	42	—25	35	—30	28	—37	21	—55	14	—87	7
— 4	.037	— 5	93	— 7	86	— 9	79	—11	72	—13	65	—15	59	—17	52	—20	45	—23	38	—27	31	—32	24	—43	17	—64	11
— 3	039	— 4	93	— 6	87	— 8	80	— 9	73	—11	67	—13	60	—16	54	—18	47	—21	41	—24	34	—28	27	—34	21	—51	14
— 2	.041	— 3	94	— 5	87	— 6	81	— 8	74	—10	68	—12	62	—14	56	—16	49	—19	43	—22	37	—26	30	—30	24	—38	18
— 1	.043	— 2	94	— 4	88	— 5	82	— 7	75	— 9	69	—10	63	—12	57	—15	51	—17	45	—20	39	—23	33	—27	27	—32	21
0	.045	— 1	94	— 3	88	— 4	82	— 6	76	— 7	71	— 9	65	—11	59	—13	53	—15	47	—18	42	—21	36	—24	30	—28	24
1	.047	0	94	— 2	89	— 3	83	— 4	77	— 6	72	— 8	66	— 9	61	—11	55	—13	49	—16	44	—18	38	—21	33	—25	28
2	.049	1	95	0	89	— 2	84	— 3	78	— 5	73	— 6	68	— 8	62	—10	57	—12	51	—14	46	—16	41	—19	36	—22	31
3	.052	2	95	1	90	— 1	84	— 2	79	— 3	74	— 5	69	— 6	64	— 8	59	—10	53	—12	48	—14	43	—17	38	—20	33
4	.054	3	95	2	90	0	85	— 1	80	— 2	75	— 4	70	— 5	65	— 7	60	— 8	55	—10	58	—13	45	—15	40	—17	35
5	.057	4	95	3	90	2	86	0	81	— 1	76	— 2	71	— 4	66	— 5	62	— 7	57	— 9	52	—11	47	—13	43	—15	38
6	.059	5	95	4	91	3	86	2	81	0	77	— 1	82	— 2	68	— 4	63	— 5	59	— 7	54	— 9	49	—11	45	—13	41
7	.062	6	95	5	91	4	96	3	82	1	78	0	73	— 1	69	— 2	64	— 4	60	— 6	56	— 7	51	— 9	47	—11	43
8	065	7	96	6	92	5	87	4	83	3	79	2	74	0	70	— 1	66	— 3	61	— 4	57	— 6	53	— 7	49	— 9	45
9	.068	8	96	7	92	6	87	5	83	4	79	3	75	2	71	0	67	— 1	63	— 3	59	— 4	55	— 6	51	— 8	47
10	.071	9	96	8	92	7	88	6	84	5	80	4	76	3	72	2	68	0	64	— 1	60	— 3	56	— 4	52	— 6	48
11	.074	10	96	9	92	8	88	7	85	6	81	5	77	4	73	3	69	2	65	0	62	— 1	58	— 2	54	— 4	50
12	.078	11	96	10	93	9	89	8	85	7	81	6	78	5	74	4	70	3	66	2	63	0	59	— 1	56	— 3	52
13	.081	12	96	11	93	10	89	9	86	9	82	8	78	7	75	5	71	4	68	3	64	2	61	1	57	— 1	53
14	.085	13	96	12	93	12	90	11	86	10	83	9	79	8	76	7	72	6	69	5	65	3	62	2	59	9	55

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature	Vapor tension	Depression of the wet-bulb thermometer (*t*-*t'*).																								
		0.2		0.4		0.6		0.8		1.0		1.2		1 4		1.6		1.8		2.0		2.2		2.4		2.6	
		Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
15	.088	14	97	13	93	13	90	12	87	11	83	10	80	9	77	8	73	7	70	6	67	5	63	4	60	2	57
16	.092	15	97	14	94	14	98	13	87	12	84	11	81	10	77	9	74	8	71	7	68	6	65	5	61	3	58
17	.096	16	97	16	94	15	91	14	87	13	84	12	81	11	78	10	75	9	72	8	69	7	66	6	63	5	60
18	.101	17	97	17	94	16	91	15	88	14	85	14	82	13	76	12	76	11	73	10	70	9	67	8	64	6	61
19	.105	18	97	18	94	17	91	16	88	15	85	15	82	14	79	13	76	12	74	11	71	10	68	9	65	8	62
20	.110	19	97	19	94	18	91	17	89	16	86	16	83	15	80	14	77	13	74	12	72	12	69	10	66	9	63

TABLE A.—*Dew-point and relative humidity.*

Air temperature.	Vapor tension.	Depression of the wet bulb thermometer (t—t').																					
		0.5		1.0		1.5		2.0		2.5		3.0		3.5		4.0		4.5		5.0		5.5		6.0	
		Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.
20	.110	18	93	16	86	14	79	12	72	9	65	7	58	4	51	1	44	—3	37	—7	30	—13	23	—19	16
21	.114	19	93	18	86	16	79	14	73	11	66	9	59	6	52	3	45	—1	39	—4	32	—10	25	—15	19
22	.119	20	93	19	86	17	80	15	73	12	67	10	60	7	54	5	47	1	41	—2	34	—7	28	—12	21
23	.124	21	93	20	87	18	80	16	74	14	68	12	61	9	55	6	49	3	43	0	36	—5	30	—9	24
24	.130	22	94	21	87	19	81	17	75	15	69	13	62	10	56	8	50	5	44	2	38	—2	32	—6	26
25	.135	23	94	22	88	20	82	18	76	16	70	14	63	12	57	10	52	7	46	4	40	0	34	—3	28
26	.141	24	94	23	88	21	82	20	76	18	71	16	65	13	59	11	53	8	47	6	42	2	36	—1	30
27	.147	25	94	24	89	22	83	21	77	19	72	17	66	15	60	13	54	10	49	8	43	4	38	1	32
28	.153	26	95	25	89	23	83	22	78	20	72	18	67	16	61	14	56	11	50	9	45	6	39	3	34
29	.159	27	95	26	89	24	84	23	78	21	73	20	67	18	62	16	57	13	51	11	47	8	41	5	36
30	.166	28	95	27	89	25	84	24	79	22	73	21	68	19	63	17	58	15	53	13	48	10	43	7	38
31	.173	29	95	28	90	26	84	25	79	23	74	22	69	20	64	19	59	16	54	14	49	11	45	9	40
32	.180	30	95	29	90	28	85	27	80	25	75	23	70	21	65	20	61	18	56	16	51	13	46	11	41
33	.187	31	95	30	90	29	85	28	80	26	76	25	71	23	66	21	62	19	57	17	52	15	47	13	43
34	.195	32	95	31	90	30	85	29	81	27	76	26	72	24	67	23	63	21	58	19	53	16	49	14	44
35	.203	33	95	32	91	31	86	30	81	28	77	27	72	25	68	24	64	22	59	20	54	18	50	16	45
36	.211	35	96	34	91	32	86	31	82	29	77	28	78	26	69	25	64	23	60	22	55	20	51	18	47
37	.219	36	96	35	91	33	87	32	82	30	78	29	74	27	69	26	65	24	61	23	56	21	52	19	48
38	.228	37	96	36	92	34	87	33	83	32	79	31	75	29	70	28	66	26	62	24	57	22	53	21	50
39	.237	38	96	37	92	35	88	34	83	33	79	32	75	30	71	29	67	27	63	26	58	24	54	22	51

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature	Vapor tension	Depression of the wet bulb (*t*—*t′*).																						
		0.5		1.0		1.5		2.0		2.5		3.0		3.5		4.0		4.5		5.0		5.5		6.0	
		Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
40	.246	39	96	38	92	36	88	35	84	34	80	33	76	31	72	30	68	28	63	27	59	25	55	24	52
41	.256	40	96	39	92	37	88	36	84	35	80	34	76	32	72	31	68	29	64	28	60	26	57	25	53
42	.266	41	96	40	92	39	88	38	84	36	81	35	77	34	73	33	69	31	65	29	61	27	58	26	54
43	.277	42	96	41	92	40	88	39	85	37	81	36	77	35	74	34	70	32	66	31	62	29	58	28	55
44	.288	43	96	42	92	41	88	40	85	38	81	37	78	36	74	35	70	33	67	32	63	30	59	29	56
45	.298	44	96	43	92	42	89	41	85	40	82	39	78	37	75	36	71	34	67	33	64	31	60	30	57
46	.310	45	96	44	93	43	89	42	85	41	82	40	79	38	75	37	72	36	68	35	66	33	61	32	58
47	.322	46	96	45	93	44	89	43	86	42	82	41	79	40	76	39	72	37	69	36	66	34	62	33	59
48	.334	47	96	46	93	45	89	44	86	43	83	42	79	41	76	40	73	38	69	37	66	36	63	35	60
49	.347	48	97	47	93	46	90	45	86	44	83	43	80	42	76	41	73	39	70	38	67	37	63	36	60
50	.360	49	97	48	93	47	90	46	87	45	83	44	80	43	77	42	74	41	70	40	68	38	64	37	61
51	.373	50	97	49	93	48	90	47	87	46	84	45	81	44	77	43	74	42	71	41	69	39	65	38	62
52	.387	51	97	50	94	49	90	48	87	47	84	46	81	45	78	44	75	43	72	42	69	41	66	40	63
53	.402	52	97	51	94	50	91	49	87	48	84	47	81	46	78	45	75	44	72	43	70	42	66	41	63
54	.417	53	97	52	94	51	91	50	88	50	85	49	82	47	79	46	76	45	73	44	70	43	67	42	64
55	.432	54	97	53	94	53	91	52	88	51	85	50	82	49	79	48	76	47	73	46	70	44	68	43	65
56	.448	55	97	54	94	54	91	53	88	52	85	51	82	50	80	49	77	48	74	47	71	45	68	44	65
57	.465	56	97	55	94	55	91	54	88	53	86	52	83	51	80	50	77	49	74	48	71	47	69	46	66
58	.481	57	97	56	94	56	91	55	89	54	86	53	83	52	80	51	78	50	75	49	72	48	69	47	67
59	.499	58	97	57	94	57	92	56	89	55	86	54	83	53	81	52	78	51	75	50	72	49	70	48	67

60......	.517	59	97	58	94	58	91	57	89	56	86	55	84	54	81	53	78	52	75	51	73	50	70	40	68
61......	.536	60	97	59	94	59	92	58	89	57	87	56	84	55	81	54	78	53	76	52	73	51	71	50	68
62......	.555	61	97	60	95	60	92	59	89	58	87	57	84	56	81	55	79	54	76	53	74	52	71	52	69
63.....	.575	62	97	61	95	61	92	60	89	59	87	58	84	57	82	56	79	55	77	55	74	54	72	51	69
64......	.595	63	97	62	95	62	92	61	90	60	87	59	85	58	82	57	70	56	77	56	74	55	72	54	70
65......	.616	64	97	63	95	63	92	62	90	61	87	60	85	59	82	59	80	58	77	57	75	56	72	55	70
66......	.638	65	97	64	95	64	93	63	90	62	87	61	85	51	82	60	80	59	78	58	75	57	73	56	71
67......	.661	67	98	66	95	65	93	64	90	63	88	62	85	61	83	61	80	60	78	59	76	58	73	57	71
68......	.684	68	98	67	95	66	93	65	90	64	88	63	85	62	83	62	81	61	78	60	76	59	74	58	71
69	.707	69	98	68	95	67	98	66	90	65	88	64	86	63	83	63	81	62	78	61	76	60	74	59	72
70......	.732	70	98	69	95	68	93	67	90	67	88	66	86	65	83	64	81	63	79	62	77	61	74	61	72
71......	.757	71	98	70	95	69	93	68	91	68	88	67	86	66	84	65	81	64	79	63	77	62	75	62	72
72......	.783	72	98	71	95	70	93	69	91	69	88	68	86	67	84	66	82	65	79	64	77	63	75	63	73
73......	.810	73	98	72	95	71	93	70	91	70	88	69	86	68	84	67	82	66	80	66	78	65	75	64	73
74......	.838	74	98	73	95	72	93	71	91	71	88	70	86	69	84	68	82	67	80	67	78	66	75	65	74
75......	.866	75	98	74	95	73	93	72	91	72	89	71	87	70	84	69	82	68	80	68	78	67	76	66	74
76......	.896	76	98	75	95	74	93	73	91	73	89	72	87	71	85	70	82	69	80	69	78	68	76	67	74
77.....	.926	77	98	76	95	75	93	74	91	74	89	73	87	72	85	71	83	70	80	70	78	69	76	68	74
78......	.957	78	98	77	96	76	93	75	91	75	89	74	87	73	85	72	83	71	81	71	79	70	77	69	75
79......	.989	79	98	78	96	77	94	76	91	76	89	75	87	74	85	73	83	72	81	72	79	71	77	70	75
80......	1.022	80	98	79	96	78	94	77	92	77	89	76	87	75	85	74	83	73	81	73	79	72	77	72	75

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature.	Depression of the wet bulb (t—t').																								
	6.0		6.5		7.0		7.5		8.0		8.5		9.0		9.5		10.0		10.5		11.0		11.5		12.0	
	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew.point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.	Dew-point.	Rel. humidity.
20	—19	16	39	9	—70	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
21	—15	19	24	12	—40	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
22	—12	21	18	15	—28	9	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
23	—9	24	15	17	—23	11	—62	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
24	—6	26	12	20	—18	14	—30	9	—67	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
25	—3	28	—8	22	—14	17	—22	12	—36	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
26	—1	30	—5	24	—10	19	—17	14	—26	8	—60	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....
27	1	32	—3	27	—7	22	—13	16	—21	11	—30	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....
28	3	34	0	29	—4	24	—10	19	—16	14	—24	8	—54	3	....	....	....	....	....	....	....	....	....	....	....	....
29	5	36	2	31	—2	26	—7	21	—12	16	—18	11	—30	6	—70	1	....	....	....	....	....	....	....	....	....	....
30	7	38	4	33	1	28	—3	23	—8	18	—14	13	—23	9	—40	4	....	....	....	....	....	....	....	....	....	....
31	9	40	6	35	3	30	1	25	—5	21	—10	16	—16	11	—25	7	—63	2	....	....	....	....	....	....	....	....
32	11	41	8	37	5	32	2	28	—2	23	—7	18	—12	14	—20	9	—32	5	....	....	....	....	....	....	....	....
33	13	43	10	38	7	34	4	29	0	25	—4	20	—16	14	—12	23	—23	7	—50	5	....	....	....	....	....	....
34	14	44	11	40	9	35	6	31	3	27	—1	22	—5	18	—10	14	—18	10	—28	7	—74	2	....	....	....	....
35	16	45	13	41	11	37	8	33	5	29	2	24	—2	20	—7	16	—13	12	—20	8	—35	4	....	....	....	....
36	18	47	15	43	13	38	10	34	8	30	4	26	1	24	—3	18	—8	14	—15	10	—25	6	....	1	....	....
37	19	48	17	44	15	40	12	36	10	32	7	28	4	24	0	20	—5	16	—10	12	—17	9	....	4	....	....
38	21	50	19	46	17	42	14	38	12	34	9	30	6	26	8	22	—1	18	—6	15	—12	11	—20	7	—35	8
39	22	51	20	47	18	43	16	39	14	35	11	32	8	28	5	24	2	20	—3	17	—8	13	—14	9	—23	6

40	24	52	22	48	20	44	18	41	16	37	13	33	11	30	7	26	4	22	0	19	—4	15	—10	11	—16	8
41	25	53	23	49	22	46	19	42	17	38	15	35	13	31	10	28	7	24	3	21	0	17	—5	13	—11	10
42	26	54	24	50	23	47	21	43	19	40	17	36	15	33	12	29	9	26	6	22	3	19	—1	15	—6	12
43	28	55	26	51	25	48	23	45	21	41	19	38	17	34	14	31	13	28	9	24	6	21	2	17	—2	14
44	29	56	27	52	26	49	24	46	23	43	22	39	19	36	16	32	14	29	11	26	8	13	5	19	1	16
45	30	57	28	53	27	50	26	47	24	44	24	40	20	37	18	34	16	31	13	28	11	24	7	21	4	18
46	32	58	30	54	29	51	27	48	26	45	24	42	22	38	20	35	18	32	15	29	13	26	10	23	7	20
47	33	59	31	55	30	52	29	49	27	46	25	43	24	40	22	37	20	34	17	31	15	28	12	25	10	22
48	35	60	33	56	32	53	30	50	29	47	27	44	25	41	23	38	22	35	19	32	17	29	14	26	12	23
49	36	60	34	57	33	54	31	51	30	48	28	45	27	42	25	39	23	36	21	33	19	30	17	28	14	25
50	37	61	35	58	34	55	33	52	31	49	30	46	28	43	27	40	25	37	23	35	21	32	19	29	17	26
51	38	62	37	59	36	56	34	53	33	50	31	47	30	45	28	42	27	39	25	36	23	33	21	30	19	28
52	40	63	38	60	37	57	36	54	34	51	33	48	31	46	30	43	28	40	27	37	25	35	23	32	21	29
53	41	63	39	61	38	58	37	55	36	52	34	49	33	47	31	44	30	41	28	38	27	36	25	33	23	31
54	42	64	41	61	40	59	39	56	37	53	36	50	34	48	33	45	31	42	30	39	28	37	27	34	25	32
55	43	65	42	62	41	59	40	57	39	54	37	51	36	49	34	46	33	43	31	40	30	38	28	36	27	33
56	44	65	43	63	42	60	41	57	40	55	39	52	37	50	36	47	34	44	33	42	31	39	30	37	28	34
57	46	66	45	64	44	61	42	58	41	55	40	53	39	50	37	48	36	45	35	43	33	40	31	38	30	36
58	47	67	46	64	45	61	44	59	42	56	41	53	40	51	39	49	37	46	36	44	35	42	33	39	31	37
59	48	67	47	65	46	62	45	60	44	57	43	54	41	52	40	49	39	47	28	45	36	43	35	40	33	38
60	49	68	48	65	47	63	46	60	45	58	44	55	43	53	41	50	40	48	39	46	38	44	36	41	35	39
61	50	68	49	66	48	63	47	61	46	58	45	56	44	54	43	51	42	49	41	47	39	44	38	42	36	40
62	52	69	51	66	50	64	49	61	48	59	47	57	45	54	44	52	43	50	42	47	41	45	39	43	38	41
63	53	69	52	67	51	64	50	62	49	60	48	57	47	55	45	53	44	51	43	48	42	46	41	44	39	42
64	54	70	53	67	52	65	51	62	50	60	49	58	48	56	47	53	46	51	45	49	43	47	42	45	41	43
65	55	70	54	68	53	65	52	63	51	61	50	59	49	56	48	54	47	52	46	50	45	48	43	46	42	44'
66	56	71	55	68	54	66	53	63	52	61	51	59	50	57	49	55	48	53	47	51	46	49	45	47	44	45
67	57	71	56	69	55	66	55	64	54	62	53	60	52	58	51	55	50	53	48	51	47	49	46	47	45	45
68	58	72	57	69	57	67	56	65	55	63	54	60	53	58	52	56	51	54	50	52	49	50	47	48	46	46
69	59	72	58	70	58	67	57	65	56	63	55	61	54	59	53	57	52	55	51	53	50	51	49	49	48	47
70	61	72	60	70	59	68	58	66	57	64	56	62	55	60	54	57	53	55	52	53	51	52	50	50	49	48
71	62	72	61	70	60	68	59	66	58	64	57	62	56	60	55	58	55	56	54	54	53	52	52	50	51	48
72	63	73	62	71	61	69	60	67	59	65	59	63	58	61	57	59	56	57	55	55	54	53	53	51	52	49
73	64	73	63	71	62	69	62	67	61	65	60	63	59	61	58	59	57	57	56	55	55	53	54	52	53	50
74	65	73	64	72	63	70	63	68	62	66	61	64	60	62	59	60	58	58	57	56	56	54	55	52	54	50

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature............	Depression of the wet bulb (*t*—*t′*).																									
	6.0		6.5		7.0		7.5		8.0		8.5		9.0		9 5		10.0		10.5		11.0		11.5		12.0	
	Dew-point... ..	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point.....	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point.	Rel. humidity...
75	66	74	65	72	64	70	64	68	63	66	62	64	61	62	60	60	59	58	58	56	57	55	56	53	56	51
76	67	74	66	72	65	70	65	68	64	66	63	64	62	63	61	61	61	59	60	57	59	55	58	53	57	52
77	68	74	67	73	67	71	66	69	65	67	64	65	63	63	62	61	62	59	61	57	60	56	59	54	58	52
78	69	75	68	73	68	71	67	69	66	67	66	65	65	63	64	62	63	60	62	58	61	56	60	54	59	53
79	70	75	69	73	69	71	68	70	67	68	67	66	66	64	65	92	64	60	63	58	62	57	61	55	61	53
80	72	75	71	73	70	72	69	70	68	68	68	66	67	64	76	63	65	61	64	59	63	57	62	55	62	54

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature.	Depression of the wet bulb (*t*—*t′*).																											
	12.0		12.5		13.0		13.5		14.0		14.5		15.0		15.5		16.0		16.5		17.0		17.5		18.0	
	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
40	—16	8	—34	4	—74	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
41	—11	10	—19	6	—32	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
42	— 6	12	—13	9	—22	6	—40	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
43	— 2	14	— 8	11	—15	8	—25	5	—63	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
44	1	16	— 4	13	— 9	10	—17	7	—28	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
45	4	18	0	15	— 5	12	—11	9	—19	6	—34	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....
46	7	20	3	17	— 1	14	— 6	11	—12	8	—21	5	—46	2	....	....	....	....	....	....	....	....	....	....	....	....
47	10	22	6	19	3	16	— 1	13	— 7	10	—14	7	—25	4	—61	1	....	....	....	....	....	....	....	....	....	....
48	12	23	9	20	6	18	2	15	— 2	12	— 8	9	—16	6	—28	3	—80	3	....	....	....	....	....	....	....	....
49	14	25	11	22	9	19	5	17	1	14	— 3	11	—10	8	—18	5	—32	1	....	....	....	....	....	....	....	....
50	17	26	14	23	11	21	8	18	5	16	0	13	— 5	10	—11	7	—20	5	—38	2	....	....	....	....	....	....
51	19	28	16	25	14	22	11	20	8	17	4	15	0	12	— 5	9	—12	7	—21	4	—46	2	....	....	....	....
52	21	29	18	26	16	24	13	21	11	19	7	16	3	13	— 1	11	— 6	9	—13	6	—23	4	—53	1	....	....
53	23	31	20	28	18	25	16	23	13	20	10	18	7	15	2	13	— 6	10	— 5	8	—15	5	—25	3	—74	1
54	25	32	23	29	20	27	18	24	16	22	13	19	10	17	6	14	2	12	— 2	10	— 8	7	—16	5	—28	3
55	27	33	25	31	23	28	20	26	18	23	15	21	12	18	9	16	6	14	2	11	— 3	9	— 9	7	—17	4
56	28	34	26	32	25	30	22	27	20	25	18	22	15	20	12	17	9	15	5	13	1	11	— 4	8	—10	6
57	30	36	28	33	26	31	24	28	22	26	20	24	18	21	15	19	12	17	9	14	5	12	0	10	— 4	8
58	31	37	30	34	28	32	26	29	24	27	22	25	20	23	18	20	15	18	12	16	9	14	4	12	0	10
59	33	38	32	36	30	33	28	31	26	29	24	26	22	24	20	22	18	20	15	17	12	15	8	13	4	11

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature..........	Depression of the wet-bulb thermometer (*t*—*t*′).																									
	12.0		12.5		13.5		13.5		14.0		14.3		15.0		15.5		16.0		16.5		17.0		17.5		18.0	
	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point.......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point.....	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point.....	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...
60....	35	39	33	37	32	34	30	32	28	30	26	28	24	25	22	23	20	21	18	19	15	17	12	15	8	13
61....	36	40	35	38	33	35	32	33	30	31	28	29	26	27	24	24	22	22	20	20	18	18	15	16	12	14
62....	38	41	37	39	35	37	34	34	32	32	30	30	28	28	26	26	24	24	22	22	20	20	18	18	15	16
63....	39	42	38	40	37	38	35	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
64....	41	43	39	41	38	38	37	36	35	34	34	32	32	30	30	28	28	26	27	24	24	22	22	20	20	18
65....	42	44	41	42	40	39	38	37	37	35	35	33	34	31	32	29	30	27	28	25	27	24	25	22	23	20
66....	44	45	43	42	41	40	40	38	38	36	37	34	35	32	34	30	32	29	30	27	29	25	27	23	25	21
67....	45	45	44	43	43	41	41	39	40	37	37	35	37	33	36	32	34	30	32	28	31	26	29	24	27	22
68....	46	46	45	44	44	42	43	40	42	38	40	36	39	34	38	33	36	31	34	29	33	27	31	25	29	23
69....	48	47	47	45	46	43	45	41	43	39	42	37	40	35	39	33	38	32	36	30	34	28	33	26	31	24
70 ...	49	48	48	46	47	44	46	42	45	40	43	38	42	36	41	34	41	33	38	31	36	29	35	27	33	26
71....	51	48	49	46	48	45	47	43	46	41	45	39	43	37	42	35	41	34	39	32	38	30	36	28	35	27
72....	52	49	51	47	50	45	49	43	47	42	46	40	45	38	44	36	43	35	41	33	40	31	38	30	37	28
73....	53	50	52	48	51	46	50	44	49	42	48	41	46	39	45	37	44	35	43	34	41	32	40	30	38	29
74....	54	50	53	48	52	47	51	45	50	43	49	41	48	40	47	38	45	36	44	35	43	33	41	31	40	30
75....	56	51	55	49	54	47	53	46	52	44	50	42	49	40	48	39	47	37	45	35	44	34	43	32	42	31
76 ...	57	52	56	50	55	48	54	46	53	45	52	43	50	41	49	39	48	38	47	36	46	35	45	33	43	31
77....	58	52	57	50	56	49	55	47	54	45	53	44	52	42	51	40	50	39	49	37	48	35	46	34	45	32
78....	59	53	58	51	57	49	56	48	55	46	54	44	53	43	52	41	51	39	50	38	49	36	48	35	47	33
79....	61	53	60	52	59	50	56	48	57	47	56	45	55	43	54	42	53	40	52	39	51	37	49	36	48	34
80 ...	62	54	61	52	60	51	59	49	58	47	57	45	58	44	55	42	54	41	53	39	52	38	51	36	50	35

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature.	Depression of the wet bulb (*t*—*t'*).																									
	18.0		19.0		20.0		31.0		22.0		23.0		24.0		25.0		26.0		27.0		28.0		29.0		30.0	
	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
59	4	11	—5	7	—22	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
60	8	13	0	9	—12	5	—63	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
61	12	14	4	10	—6	6	—25	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
62	15	16	8	12	0	8	—14	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
63	18	17	12	13	4	9	—6	6	—26	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
64	20	18	15	15	8	11	0	7	—15	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
65	23	20	18	16	12	12	4	9	—6	5	—28	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....
66	25	21	20	17	15	14	8	10	—1	7	—15	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....
67	27	22	23	19	18	15	12	12	4	8	—7	5	—28	1	....	....	....	....	....	....	....	....	....	....	....	....
68	29	23	25	20	20	16	25	13	8	10	—1	6	—16	3	....	....	....	....	....	....	....	....	....	....	....	....
69	31	24	27	21	23	18	18	14	12	11	4	8	—7	5	—32	....	....	....	....	....	....	....	....	....	....	....
70	33	26	29	22	25	19	21	16	15	12	9	9	0	6	—16	2	....	....	....	....	....	....	....	....	....	....
71	35	27	31	23	28	20	23	17	18	14	12	10	5	7	—7	4	—32	1	....	....	....	....	....	....	....	....
72	37	28	33	24	30	21	26	18	21	15	16	12	9	9	0	6	—16	3	....	....	....	....	....	....	....	....
73	38	29	35	25	32	22	28	19	24	16	19	13	13	10	5	7	—6	4	—30	1	....	....	....	....	....	....
74	40	30	37	26	34	23	30	20	26	17	22	14	16	11	9	8	0	6	—15	3	....	....	....	....	....	....
75	42	31	39	27	36	24	32	21	29	18	24	15	19	12	13	9	5	7	—6	4	—28	1	....	....	....	....
77	43	31	41	28	38	25	34	22	31	19	27	16	22	14	17	11	10	8	1	5	—14	3	....	....	....	....
77	45	32	42	29	40	26	36	23	33	20	29	17	25	15	20	12	14	9	6	6	—5	4	—26	1	....	....

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature	Depression of the wet bulb (*t t′*).																									
	18.0		19.0		20.0		21.0		22.0		23.0		24.0		25.0		25.0		27.0		28.0		29.0		30.0	
	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
78....	47	33	44	30	41	27	38	34	35	21	31	18	28	16	23	13	17	10	11	8	2	5	—12	3	....	....
79....	48	34	46	31	43	28	40	25	37	22	34	19	30	17	26	14	21	11	15	9	7	6	— 4	4	—23	1
80....	50	35	47	32	45	29	42	26	39	23	36	20	32	18	28	15	24	13	18	10	12	7	3	5	—11	3

TABLE A.—*Dew-point and relative humidity.*

Air temperature......	Vapor tension...............	Depression of the wet bulb thermometer ($t—t'$).																							
		1.0		2.0		3.0		4.0		5.0		6.0		7.0		8.0		9.0		10.0		11.0		12.0	
		Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...	Dew-point.... .	Rel. humidity...	Dew-point......	Rel. humidity ..	Dew-point......	Rel. humidity...	Dew-point......	Rel. humidity...
80......	1.022	79	96	77	92	76	87	74	83	73	79	72	75	70	72	68	68	67	64	65	61	63	57	62	54
81.......	1.056	80	96	78	92	77	88	76	84	74	80	73	76	71	72	70	68	68	65	66	61	65	58	63	54
82.......	1.091	81	96	79	92	78	88	77	84	75	80	74	76	72	72	71	69	69	65	68	62	66	58	64	55
83......	1.127	82	96	80	92	79	88	78	84	76	80	75	76	73	73	72	69	70	66	69	62	67	59	65	55
83.......	1.163	83	96	81	92	80	88	79	84	77	80	76	77	74	73	73	69	71	66	70	63	68	59	67	56
85.......	1.202	84	96	82	92	81	88	80	84	78	80	77	77	75	73	74	70	72	66	71	63	69	60	68	56
86.......	1.241	85	96	83	92	82	88	81	84	79	81	78	77	76	73	75	70	73	67	72	63	71	60	69	57
87......	1.281	86	96	84	92	83	88	82	84	80	81	79	77	78	74	77	70	74	67	73	64	72	60	70	57
88.......	1.322	87	96	85	92	84	88	83	85	81	81	80	77	79	74	77	71	75	67	74	64	73	61	71	58
89.......	1.364	88	96	86	92	85	88	84	85	82	81	81	78	80	74	78	71	76	68	76	64	74	61	72	58
90.......	1.408	89	96	87	92	86	88	85	85	84	81	82	78	81	75	79	71	78	68	77	65	75	62	74	59
91.......	1.453	90	96	88	92	87	89	86	85	85	82	83	78	82	75	80	71	79	68	78	65	76	62	75	59
92.......	1.499	91	96	89	92	88	89	87	85	86	82	84	78	83	75	82	72	80	69	79	65	77	62	76	59
93.......	1.546	92	96	91	93	89	89	88	85	87	82	85	78	84	75	83	72	81	69	80	66	78	63	77	60
94.......	1.595	93	96	92	93	90	89	89	86	88	82	86	79	85	75	84	72	82	69	81	66	80	63	78	60
95.......	1,645	94	96	93	93	91	89	90	86	89	82	87	79	86	76	85	72	83	69	82	67	81	63	79	60
96.......	1.696	95	96	94	93	92	89	91	86	90	82	88	79	87	76	86	73	84	70	83	67	82	64	80	61
97.......	1.749	96	96	95	93	93	89	92	86	91	82	90	79	88	76	87	73	86	70	84	67	83	64	81	61
98.......	1.803	97	96	96	93	94	89	93	86	92	83	91	79	89	76	88	73	87	70	85	67	84	64	83	61
99.......	1.859	98	96	97	93	95	89	94	86	93	83	92	80	90	76	89	73	88	70	86	68	85	65	84	62

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature	Vapor tension	Depression of the wet bulb (t—t′).																					
		1.0		2.0		3.0		4.0		5.0		6.0		7.0		8.0		9.0		10.0		11.0		12.0	
		Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
100......	1.916	99	97	98	93	96	90	95	86	94	83	93	80	91	77	90	74	89	71	87	68	86	65	85	62
101......	1.975	100	97	99	93	97	90	96	86	95	83	94	80	92	77	91	74	90	71	88	68	87	65	86	62
102......	2.035	101	97	100	93	98	90	97	86	96	83	95	80	93	77	92	74	91	71	90	68	88	65	87	63
103......	2.097	102	97	101	93	99	90	98	87	97	83	96	80	94	77	93	74	92	71	91	69	89	66	88	63
104......	2.160	103	97	102	93	100	90	99	87	98	83	97	80	96	77	94	74	93	72	92	69	90	66	89	63
105......	2.225	104	97	103	93	101	90	100	87	99	84	98	81	97	78	95	75	94	72	93	69	91	66	90	64
106......	2.292	105	97	104	93	102	90	101	87	100	84	99	81	98	78	96	75	95	72	94	69	93	66	91	64
107.....	2.360	106	97	105	93	103	90	102	87	101	84	100	81	99	78	97	75	96	72	95	69	94	67	92	64
108.. ...	2.431	107	97	106	93	104	90	103	87	102	84	101	81	100	78	98	75	97	72	96	70	95	67	93	64
109......	2.502	108	97	107	93	105	90	104	87	103	84	102	81	101	78	99	75	98	72	97	70	96	67	94	64
110......	2.576	109	97	108	94	107	90	105	87	104	84	103	81	102	78	101	76	99	73	98	70	97	67	96	65
111......	2.652	110	97	109	94	108	90	106	87	105	84	104	81	103	78	102	76	100	73	99	70	98	68	97	65
112......	2.730	111	97	110	94	109	90	107	87	106	84	105	82	104	79	103	76	101	73	100	71	99	68	98	65
113......	2.810	112	97	111	94	110	90	108	87	107	85	106	82	105	79	104	76	102	73	101	71	100	68	99	66
114......	2.891	113	97	112	94	111	91	109	88	108	85	107	82	106	79	105	76	103	74	102	71	101	68	100	66
115......	2.975	114	97	113	94	112	91	110	88	109	85	108	82	107	79	106	76	105	74	103	71	102	69	101	66
116......	3.061	115	97	114	94	113	91	111	88	110	85	109	82	108	79	107	76	106	74	104	71	103	69	102	66
117......	3.149	116	97	115	94	114	91	112	88	111	85	110	82	109	79	108	77	107	74	105	71	104	69	103	66
118......	3.220	117	97	116	94	115	91	113	88	112	85	111	82	110	79	109	77	108	74	106	72	105	69	104	67
119......	3.331	118	97	117	94	116	91	114	88	113	85	112	82	111	80	110	77	109	74	107	72	106	69	105	67

120......	3.425	119	97	118	94	117	91	115	88	114	85	113	83	112	80	111	77	110	75	108	72	107	70	106	67
121......	3.522	120	97	119	94	118	91	117	88	115	85	114	83	113	80	112	77	111	75	110	72	108	70	107	67
122......	3.621	121	97	120	94	119	91	118	88	116	85	115	83	114	80	113	77	112	75	111	72	109	70	108	67
123.....	3.723	122	97	121	94	120	91	119	88	117	85	116	83	115	80	114	78	113	75	112	73	110	70	109	68
124......	3.827	123	97	122	94	121	91	110	88	118	85	117	83	116	80	115	78	114	75	113	73	111	70	110	68
125......	3.933	124	97	123	94	122	91	121	88	119	86	118	83	117	80	116	78	115	75	114	73	112	70	111	68
126......	4.042	125	97	124	94	123	91	122	88	120	86	119	83	118	80	117	78	116	75	115	73	114	71	112	68
127......	4.154	126	97	125	94	124	91	123	88	121	86	120	83	119	81	118	78	117	75	116	73	115	71	113	68
128......	4.268	127	97	126	94	125	91	124	88	122	86	121	83	120	81	119	78	118	75	117	73	116	71	114	68
129......	4.335	128	97	127	94	126	91	125	88	123	86	122	83	121	81	120	78	119	75	118	73	117	71	115	69
130......	4.504	129	97	128	94	127	91	126	89	124	86	123	84	122	81	121	78	120	76	119	74	118	71	117	69
131.....	4.627	130	97	129	94	128	92	127	89	125	86	124	84	123	81	122	79	121	76	120	74	119	71	118	69
132.....	4.752	131	97	130	94	129	92	128	89	126	86	125	84	124	81	123	79	122	76	121	74	120	71	119	69
133......	4.880	132	97	131	94	130	92	129	89	128	86	126	84	125	81	124	79	123	76	122	74	121	71	120	69
134.....	5.011	133	97	132	94	131	92	120	89	129	86	127	84	126	81	125	79	124	76	123	74	122	72	121	70
135.....	5.145	134	97	133	94	132	92	131	89	130	86	128	84	127	81	125	79	125	77	124	74	124	72	122	70
136......	5.282	135	97	134	94	133	92	132	89	131	87	129	84	128	82	127	79	126	77	125	74	125	72	123	70
137......	5.422	136	97	135	94	134	92	133	89	132	87	130	84	129	82	128	79	127	77	126	75	126	72	124	70
138......	5.565	137	97	136	95	135	92	134	89	133	87	131	84	130	82	129	79	128	77	127	75	127	72	125	70
139......	5.712	138	97	137	95	136	92	135	89	134	87	132	84	131	82	130	79	129	77	128	75	128	72	126	70
140......	5.862	139	97	138	95	137	92	136	89	135	87	133	84	132	82	131	79	130	77	129	75	128	73	127	71

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature......	Depression of the wet bulb (t—t').																									
	12.0		13.0		14.0		15.0		16.0		17.0		18.0		19.0		20.0		21.0		22.0		23.0		24.0	
	Dew-point.......	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...	Dew-point	Rel. humidity...
80	62	54	60	51	58	47	56	44	54	41	52	38	50	35	47	32	45	29	42	26	39	23	36	20	32	18
81	63	54	61	51	59	48	57	44	55	41	53	38	51	35	49	33	47	30	44	27	41	24	38	21	35	19
82	64	55	62	52	61	48	59	45	57	42	55	39	53	36	50	33	48	31	45	28	43	25	40	22	37	20
83	65	55	64	52	62	49	60	46	58	43	56	40	54	37	52	34	50	31	47	29	44	26	42	23	39	21
83	67	56	65	53	63	49	61	46	59	44	57	41	55	38	53	35	51	32	49	29	46	27	43	24	41	22
85	68	56	66	53	64	50	62	47	61	44	59	41	57	38	55	36	53	33	50	30	48	28	45	25	42	22
86	69	57	67	54	66	51	64	48	62	45	60	42	58	39	56	36	54	34	52	31	49	29	47	26	44	23
87	70	57	68	54	67	51	65	48	63	45	61	42	59	40	57	37	55	34	53	32	51	30	48	27	46	24
88	71	58	70	55	68	52	66	49	64	46	63	43	61	40	59	38	57	35	55	32	53	30	50	27	48	25
89	72	58	71	55	69	52	67	49	66	46	64	44	62	41	60	38	58	36	56	33	54	30	52	28	49	26
90	74	59	72	56	70	53	69	50	67	47	65	44	63	41	62	39	60	36	58	34	56	31	53	29	51	26
91	75	59	73	56	72	53	70	50	68	47	67	45	65	42	63	39	61	37	59	35	57	32	55	30	53	27
92	76	59	74	56	73	54	71	51	69	48	68	45	66	43	64	40	62	37	60	35	58	33	56	30	54	23
93	77	60	75	57	74	54	72	51	71	48	69	46	67	43	66	41	64	38	62	36	60	33	58	31	56	29
94	78	60	77	57	75	54	73	52	72	49	70	46	69	44	67	41	65	39	63	36	61	34	59	31	57	29
95	79	60	78	58	76	55	75	52	73	49	71	47	70	44	68	42	66	39	64	37	63	34	61	32	59	30
96	80	61	79	58	77	55	76	53	74	50	73	47	71	45	69	42	68	40	66	37	64	35	62	33	60	30
97	81	61	80	58	78	56	77	53	75	50	74	48	72	45	71	43	69	40	67	38	65	36	63	33	61	31
98	83	61	81	59	80	56	78	53	77	51	75	48	73	46	72	43	70	41	68	38	67	86	65	34	63	32
99	84	62	82	59	81	56	79	54	78	51	76	49	75	46	73	44	71	41	70	39	68	37	66	34	64	32

100...	85	62	83	59	82	57	80	54	79	51	77	49	76	47	74	44	73	42	71	39	69	37	67	35	66	33
101...	86	62	84	60	83	57	82	54	80	52	79	49	77	47	75	45	74	42	72	40	71	38	69	36	67	33
102...	87	63	85	60	84	57	83	55	81	52	80	50	78	47	77	45	75	43	73	40	72	38	70	36	68	34
103...	88	63	87	60	85	58	84	55	82	53	81	50	79	48	78	45	76	43	75	41	73	39	71	37	70	34
104...	89	63	88	61	86	58	85	55	83	53	82	51	81	48	79	46	78	44	76	41	74	39	73	37	71	35
105...	90	64	89	61	87	58	86	56	85	53	83	51	82	49	80	46	79	44	77	42	76	40	74	38	72	35
106...	91	64	90	61	89	59	87	56	86	54	84	51	83	49	81	47	80	44	78	42	77	40	75	38	74	36
107...	92	64	91	62	90	59	88	57	87	54	85	52	84	49	83	47	81	45	80	43	78	41	76	38	75	36
108...	93	64	92	62	91	59	89	57	88	54	87	52	85	50	84	47	82	45	81	43	79	41	78	39	76	37
109...	94	65	93	62	92	60	90	57	89	55	88	52	96	50	85	48	83	46	82	44	80	41	79	39	77	37
110...	96	65	94	62	93	60	92	57	90	55	89	53	87	50	86	48	85	46	83	44	82	42	80	40	79	38
111...	97	65	95	63	94	60	93	58	91	55	90	53	89	51	87	49	86	46	84	44	83	42	81	40	80	38
112...	98	65	96	63	95	60	94	58	92	56	91	53	90	51	88	49	87	47	85	45	84	43	83	40	81	39
113...	99	66	97	63	96	61	95	58	93	56	92	54	91	51	89	49	88	47	87	45	85	43	84	41	82	39
114...	100	66	99	63	97	61	96	59	95	56	93	54	92	52	91	50	89	48	88	45	86	43	85	41	84	39
115...	101	66	100	64	98	61	97	59	96	57	94	54	93	52	92	50	90	48	89	46	88	44	86	42	85	40
116...	102	66	101	64	99	61	98	59	97	57	95	55	94	52	93	50	91	48	90	46	89	44	87	42	86	40
117...	103	66	102	64	100	62	99	59	98	57	96	55	95	53	94	51	93	49	91	46	90	44	88	43	87	41
118...	104	67	103	64	101	62	100	60	99	57	97	55	96	53	95	51	94	49	92	47	91	45	90	43	88	41
119...	105	67	104	64	103	62	101	60	100	58	99	55	97	53	96	51	95	49	93	47	92	45	91	43	89	41
120...	106	67	105	65	104	62	102	60	101	58	100	56	99	54	97	51	96	49	95	47	93	45	92	44	90	42
121...	107	67	106	65	105	63	103	60	102	58	101	56	100	54	98	52	97	50	96	48	94	46	93	44	92	42
122...	108	67	107	65	106	63	105	61	103	58	102	56	101	54	90	52	98	50	97	48	96	46	94	44	93	42
123...	109	68	108	65	107	63	106	61	104	59	103	57	102	54	101	52	99	50	98	48	97	46	95	45	94	43
124...	110	68	109	66	108	63	107	61	105	59	104	57	103	55	102	53	100	51	99	48	98	47	96	45	95	43
125...	111	68	110	66	109	64	108	61	106	59	105	57	104	55	103	53	101	51	100	49	99	47	98	45	96	43
126...	112	68	111	66	110	64	109	62	108	60	106	57	105	55	104	53	103	51	101	49	100	47	99	46	97	44
127...	113	68	112	66	111	64	110	62	109	60	107	58	106	55	105	54	104	52	102	50	101	48	100	46	98	44
128...	114	68	113	66	112	64	111	62	110	60	108	58	107	56	106	54	105	52	103	50	102	48	101	46	100	44
129...	115	69	114	66	113	64	112	62	111	60	110	58	108	56	107	54	106	52	105	50	103	48	102	46	101	45
130...	117	69	115	67	114	65	113	62	112	60	111	58	109	56	108	54	107	52	106	50	104	49	103	47	102	45
131...	118	69	116	67	115	65	114	63	113	60	112	58	110	56	109	54	108	53	107	51	106	49	104	47	103	45
182...	119	69	117	67	116	65	115	63	114	61	113	59	112	57	110	55	109	53	108	51	107	49	105	47	104	46
133...	120	69	118	67	117	65	116	63	115	61	114	59	113	57	111	55	110	53	109	51	108	49	106	48	105	46
134...	121	70	120	67	118	65	117	63	116	61	115	59	114	57	112	55	111	53	110	51	109	50	108	48	106	46

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature.	Depression of the wet bulb (*t*—*t'*).																									
	12.0		13.0		14.0		15.0		16.0		17.0		18.0		19.0		20.0		21.0		22.0		23.0		24.0	
	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
135...	122	70	121	68	119	65	118	63	117	61	116	59	115	57	113	55	112	53	111	52	110	50	109	48	107	46
136. .	123	70	122	68	120	66	119	64	118	61	117	59	116	58	115	56	113	54	112	52	111	50	110	48	108	47
137...	124	70	123	68	121	66	120	64	119	62	118	60	117	58	116	56	114	54	113	52	112	50	112	49	110	47
138...	125	70	124	68	122	66	121	64	120	62	119	60	118	58	117	56	115	34	114	52	113	51	113	49	111	47
159...	126	70	125	68	124	66	122	64	121	62	120	60	119	58	118	56	117	54	115	53	114	51	114	49	112	47
140...	127	71	126	69	125	66	123	64	122	62	121	60	120	58	119	56	118	55	116	53	115	51	114	49	113	48

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature	Depression of the wet-bulb thermometer (t. t').																									
	24.0		25.0		26.0		27.0		28.0		29.0		30.0		31.0		32.0		33.0		35.0		34.0		36.0	
	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
80	32	18	28	15	24	13	18	10	12	7	3	5	—11	3	—74	1	....	....	....	....	....	....	....	....	....	....
81	35	19	31	16	26	14	22	11	16	9	8	6	— 2	4	—21	2	...	....	....	....	....	....	....	....	....	....
82	37	20	33	17	29	15	25	12	19	10	13	7	4	5	— 9	3	—54	....	....	....	....	....	....	....	....	....
83	39	21	35	18	31	16	27	13	22	11	17	8	8	6	— 1	4	—19	2	....	....	....	....	....	....	....	....
84	41	22	37	19	34	17	30	14	25	12	20	9	14	7	5	5	— 7	3	—40	1	....	....	....	....	....	....
85	42	22	39	20	36	17	32	15	28	13	23	10	18	8	11	6	1	4	—16	2	....	....	....	....	....	....
86	44	23	41	21	38	18	35	16	30	14	26	11	21	9	15	7	7	5	— 5	3	—30	1	....	....	....	....
87	46	24	43	22	40	19	37	17	33	15	29	12	24	10	19	8	12	6	3	4	—12	2	....	....	....	....
88	48	25	45	22	42	20	39	18	35	16	31	13	27	11	22	9	16	7	8	5	— 2	3	—25	1	....	....
89	49	26	47	23	44	21	41	19	38	16	34	14	30	12	25	10	20	8	13	6	4	4	—10	2	.. .	....
90	51	26	48	24	46	22	43	20	40	17	36	15	32	13	28	11	23	9	18	7	10	5	— 1	3	—20	1
91	53	27	50	25	47	23	45	20	42	18	38	16	35	14	31	12	26	10	21	8	15	6	6	4	— 7	2
92	54	28	52	26	49	23	46	21	44	19	41	17	37	15	34	13	29	11	25	9	19	7	12	5	1	3
93	56	29	53	26	51	24	48	22	46	20	43	18	39	16	36	14	32	12	28	10	23	8	16	6	8	4
94	57	29	55	27	53	25	50	23	47	21	45	18	42	16	38	14	35	13	31	11	26	9	20	7	13	5
95	59	30	56	28	54	25	52	23	49	21	46	19	44	17	40	15	37	13	33	11	29	10	24	8	18	6
96	60	30	58	28	56	26	53	24	51	22	48	20	45	18	43	16	39	14	36	12	32	10	27	9	22	7
97	61	31	59	29	57	27	55	25	53	23	50	21	47	19	45	17	41	15	38	13	34	11	30	10	25	8
98	63	32	61	29	59	27	57	25	54	23	52	21	49	19	47	18	44	16	40	14	37	12	33	10	28	9
99	64	32	62	30	60	28	58	26	56	24	54	22	51	20	48	18	46	16	43	15	39	13	35	11	31	9

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature	Depression of the wet-bulb thermometer (*t—t′*).																									
	24.0		25.0		26.0		27.0		28.0		29.0		30.0		31.0		32.0		33.0		34.0		35.0		36.0	
	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
100	66	33	64	31	62	29	60	27	57	25	55	23	53	21	50	19	48	17	45	15	41	14	38	12	34	10
101	67	33	65	31	63	29	61	27	59	25	57	23	54	21	52	20	49	18	47	16	44	14	40	13	37	11
102	68	34	66	32	65	30	63	28	61	26	58	24	56	22	54	20	51	19	49	17	46	15	43	13	39	12
103	70	34	68	32	66	30	64	28	62	26	60	25	58	23	55	21	53	19	50	17	48	16	45	14	41	12
104	71	35	69	33	67	31	65	29	63	27	61	25	59	23	57	22	55	20	52	18	50	16	47	15	44	13
105	72	35	70	33	69	31	67	30	65	28	63	26	61	24	59	22	56	20	54	19	52	17	49	15	46	14
106	74	36	72	34	70	32	68	30	66	28	63	26	62	25	60	23	58	21	56	19	53	18	51	16	48	14
107	75	36	73	34	71	32	70	31	68	29	66	27	64	25	62	23	60	22	57	20	55	18	52	17	50	15
108	76	37	74	35	73	33	71	31	69	29	67	27	65	26	63	24	61	22	59	21	57	19	54	17	52	16
109	77	37	76	35	74	33	72	32	71	30	69	28	67	26	65	25	63	23	61	21	58	20	56	18	54	16
110	79	38	77	36	75	34	74	32	72	30	70	28	68	27	66	25	64	23	62	21	60	20	58	19	55	17
111	80	38	78	36	77	34	75	33	73	31	71	29	70	27	68	26	66	24	64	21	62	21	59	19	57	18
112	81	39	79	37	78	35	76	33	74	31	73	29	71	28	69	26	67	24	65	22	63	21	61	20	59	18
113	82	39	81	37	79	35	77	33	76	32	74	30	72	28	71	27	69	25	67	22	65	22	63	20	60	19
114	83	39	82	38	80	36	79	34	77	32	75	30	74	29	72	28	70	25	68	23	66	22	64	21	62	19
115	85	40	83	38	82	36	80	34	78	33	77	31	75	29	73	28	72	26	70	23	68	23	66	21	64	20
116	86	40	84	39	83	37	81	35	80	33	78	31	76	30	75	28	73	26	71	24	69	23	67	22	65	20
117	87	41	85	39	84	37	82	35	81	33	79	32	78	30	76	29	74	27	72	24	71	24	69	22	67	21
118	88	41	87	39	85	37	84	36	82	34	81	32	79	31	77	29	76	27	74	25	72	24	70	23	68	21
119	89	41	88	40	86	38	85	36	83	34	82	33	80	31	79	29	77	28	75	25	74	25	72	23	70	22

120	90	42	89	40	88	38	86	36	85	35	83	33	82	31	80	30	78	28	77	26	75	25	73	24	71	22
121	92	42	90	40	89	38	87	37	86	35	84	33	83	32	81	30	80	29	78	26	76	26	74	24	73	23
122	93	42	91	41	90	39	89	37	87	35	86	34	84	32	83	31	81	29	79	27	78	26	76	25	74	23
123	94	43	93	41	91	39	90	37	88	36	87	34	85	33	84	31	82	29	81	27	79	26	77	25	75	24
124	95	43	94	41	92	40	91	38	89	36	88	35	97	33	85	31	83	30	82	28	80	27	79	25	77	24
125	96	43	95	42	93	40	92	38	91	35	89	35	88	33	86	32	85	30	83	28	82	27	80	26	78	24
126	97	44	96	42	95	40	93	38	92	35	90	35	89	33	87	32	85	31	84	28	83	28	81	26	80	25
127	98	44	97	42	96	40	94	39	93	36	92	36	90	34	89	32	87	31	86	29	84	28	83	27	81	25
128	100	44	98	43	97	41	96	39	94	38	93	36	91	34	90	33	88	31	87	29	85	29	84	27	82	26
129	101	45	99	43	98	41	97	40	95	38	94	36	93	35	91	33	90	32	88	30	87	29	85	28	84	26
130	102	45	101	43	99	42	98	40	97	38	95	37	94	35	92	33	91	32	89	30	88	29	86	28	85	27
131	103	45	102	44	100	42	99	40	98	39	96	37	95	35	94	34	92	32	91	30	89	30	88	28	86	27
132	104	46	103	44	101	42	100	40	99	35	97	37	96	36	95	34	93	33	92	31	90	30	89	29	87	27
133	105	46	104	44	103	42	101	41	100	39	99	38	97	36	96	35	94	33	93	31	92	30	90	29	89	28
134	106	46	105	44	104	43	102	41	101	39	100	38	98	36	97	35	96	33	94	31	93	31	91	29	90	28
135	107	46	106	45	105	43	104	41	102	40	101	38	100	37	98	35	97	34	95	32	94	31	93	30	91	28
136	108	47	107	45	106	43	105	42	103	40	102	39	101	37	99	36	98	34	97	32	95	31	94	30	92	29
137	110	47	108	45	107	44	106	42	104	40	103	39	102	37	101	36	99	34	98	32	96	32	95	30	94	29
138	111	47	109	45	108	44	107	42	106	41	104	39	103	38	102	36	100	35	99	33	98	32	96	31	95	29
139	112	47	110	46	109	44	108	42	107	41	105	39	194	38	103	37	101	35	100	33	99	32	97	31	96	30
140	113	48	112	46	110	44	109	43	108	41	107	40	105	38	104	37	103	35	101	33	100	33	99	31	97	30

TABLE A.—*Dew-point and relative humidity*—Continued.

Air temperature	Depression of the wet-bulb thermometer (*t*—*t*′).																									
	36.0		37.0		38.0		39.0		40.0		41.0		42.0		43.0		44.0		45.0		46.0		47.0		48.0	
	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity	Dew-point	Rel. humidity
90	—20	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
91	—7	2	—46	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
92	1	3	—16	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
93	8	4	—4	2	—30	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
94	13	5	4	3	—11	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
95	18	6	10	4	—1	3	—22	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
96	22	7	15	5	6	3	—7	2	—63	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
97	25	8	19	6	12	4	1	3	—16	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
98	28	9	23	7	17	5	8	4	—4	2	—30	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
99	31	9	27	8	21	6	14	5	4	3	—11	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....
100	34	10	30	9	25	7	19	5	11	4	0	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....
101	37	11	32	9	28	8	23	6	16	5	7	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....
102	39	12	35	10	31	9	26	7	20	5	13	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....
103	41	12	38	11	34	9	29	8	24	6	18	5	10	3	—2	2	—28	....	....	....	....	....	....	....	....	....
104	44	13	40	12	37	10	32	8	28	7	22	6	15	4	6	3	—9	1	....	....	....	....	....	....	....	....
105	46	14	43	12	37	11	35	9	31	8	26	6	20	5	12	4	1	2	—20	1	....	....	....	....	....	....
106	48	14	45	13	42	11	38	10	34	8	29	7	24	6	17	4	9	3	—4	2	—46	....	....	....	....	....
107	50	15	47	14	44	12	40	11	37	9	32	8	28	6	22	5	15	4	4	3	—12	1	....	....	....	....
108	52	16	49	14	46	13	43	11	30	10	35	9	31	7	26	6	19	4	11	3	0	2	—23	....	....	....
109	54	16	51	15	48	13	45	12	42	10	38	9	34	8	30	6	24	5	17	4	8	3	—6	1	—74	....

110	55	17	53	15	50	14	47	13	44	11	41	10	37	8	33	7	28	6	21	5	14	4	4	2	—15	1
111	57	18	55	16	52	15	49	13	46	12	43	10	39	9	35	8	31	7	25	5	19	4	11	3	— 1	1
112	59	18	56	17	54	15	51	14	48	12	45	11	42	10	38	8	34	7	29	6	24	5	16	4	7	2
113	60	19	58	17	56	16	53	14	50	13	47	12	44	10	41	9	37	8	32	7	28	6	21	4	14	3
114	62	19	60	18	58	16	55	15	52	14	50	12	47	11	43	10	40	8	35	7	31	6	26	5	19	4
115	64	20	62	18	59	17	57	16	54	14	52	13	49	12	46	10	42	9	38	8	34	7	30	5	24	4
116	65	20	63	19	60	17	59	16	56	15	54	13	51	12	48	11	45	10	41	8	37	7	33	6	28	5
117	67	21	65	19	68	18	60	17	58	15	56	14	53	13	50	11	47	10	44	9	40	8	36	7	31	6
118	68	21	66	20	64	18	62	17	60	16	57	15	55	13	52	12	49	11	46	10	43	8	39	7	34	6
119	70	22	68	20	66	19	64	18	61	16	59	15	57	14	54	12	51	11	48	10	45	9	42	8	37	7
120	71	22	69	21	67	19	65	18	63	17	61	16	59	14	56	13	53	12	50	11	47	10	44	9	40	8
121	73	23	71	21	69	20	67	18	65	17	63	16	60	15	58	13	55	12	52	11	50	10	47	9	43	8
122	74	23	72	22	70	20	68	19	66	18	64	17	62	15	60	14	57	13	54	12	52	11	49	10	46	9
123	75	24	74	22	72	21	70	19	68	18	66	17	64	16	61	14	59	13	56	12	54	11	51	10	48	9
124	77	24	75	23	73	21	71	20	69	19	67	18	65	16	63	15	61	14	58	13	56	12	53	11	50	9
125	78	24	76	23	75	22	73	20	71	19	69	18	67	17	65	15	63	14	60	13	58	12	55	11	52	10
126	80	25	78	23	76	22	74	21	73	20	71	19	69	17	67	16	64	15	62	14	60	13	57	12	54	10
127	81	25	79	24	78	23	76	21	74	20	72	19	70	18	68	16	66	15	64	14	62	13	59	12	56	11
128	82	26	81	24	79	23	77	22	75	21	74	19	72	18	70	17	68	16	65	15	63	14	61	13	58	11
129	84	26	82	25	80	24	79	22	77	21	75	20	73	19	71	17	69	16	67	15	65	14	63	13	60	12
130	85	27	83	25	82	24	80	23	78	21	76	20	75	19	73	18	71	17	69	16	67	15	64	14	62	12
131	85	27	85	26	83	24	81	23	80	22	78	21	76	19	74	18	72	17	70	16	68	15	66	14	64	13
132	87	27	86	26	84	25	83	23	81	22	79	21	78	20	76	19	74	18	72	16	70	15	68	14	66	13
133	89	28	87	26	86	25	84	24	82	23	81	21	79	20	77	19	75	18	73	17	71	16	69	15	67	14
134	90	28	88	27	87	25	85	24	84	23	82	22	80	21	79	19	77	18	75	17	73	16	71	15	69	14
135	91	28	90	27	88	26	87	24	85	23	83	22	82	21	80	20	78	19	76	18	75	17	73	16	71	15
136	92	29	91	27	89	26	88	25	86	24	85	22	83	21	81	20	80	19	78	18	76	17	74	16	72	15
137	94	29	92	28	91	26	89	25	88	24	86	23	84	22	83	20	81	19	79	18	78	17	76	16	74	15
138	95	29	93	28	92	27	90	25	89	24	87	23	86	22	84	21	82	20	81	19	79	18	77	17	75	16
139	96	30	95	28	93	27	92	26	90	25	89	24	87	22	85	21	84	20	80	19	80	18	79	17	77	16
140	97	30	96	29	94	28	93	26	91	25	90	24	88	23	87	22	85	21	83	20	82	18	80	17	78	16

TABLE B.—*Correction of vapor tension for elevation.*

t-t′	31″	30″	29″	28″	27″	26″	25″	24″	23″	22″	21″	20″	19″	18″
1...	—.001	.000	.000	.001	.001	.001	.002	.002	.002	.003	.003	.004	.004	.004
2...	—.001	.000	.000	.001	.002	.003	.003	.004	005	.006	.006	.007	.008	.009
3...	—.002	—.001	.000	.002	003	.004	.005	.006	.007	.008	.009	.011	.012	.013
4...	—.002	—.001	.001	.002	.004	.005	.007	.008	.010	.011	.013	.014	.016	.017
5...	—.003	—.001	.001	.003	.004	.006	.008	.010	.012	.014	.016	.018	.020	.021
6...	—.004	—.001	.001	.003	.005	.008	.010	.012	.014	.017	.019	.021	.024	.025
7...	—.004	—.002	.001	.004	.006	.009	.012	.014	.017	.019	.022	.025	.027	.030
8...	—.005	—.002	.001	.004	.007	.010	.013	.016	.019	.022	.025	.028	.031	.034
9...	—.005	—.002	001	.005	.008	.011	.015	.018	.022	.025	.028	.032	.035	.039
10...	—.006	—.002	.001	.005	.009	.013	.017	.020	.024	.028	.032	.035	.039	.043
11...	—.007	—.003	.002	.006	.010	.014	.018	.022	.026	.031	.035	.039	.043	.047
12...	—.007	—.003	.002	.006	.011	.015	.020	.024	.029	.033	.038	.042	.047	.052
13...	—.008	—.003	.003	.007	.012	.017	.021	.026	.031	.036	.041	.046	.051	.056
14...	—.009	—.003	.002	.007	.013	.018	.023	.028	.034	.039	.044	.050	.055	.060
15...	—.009	—.004	.092	.008	.013	.019	..25	.030	.036	.042	.047	.053	.059	.064
16...	—.010	—.004	.002	.008	.014	.020	.026	.032	.038	.045	.051	.057	.063	.069
17...	—.011	—.004	.002	.009	.015	.022	.028	.037	.041	.047	.054	.060	.067	.073
18...	—.011	—.004	.003	.009	.016	.043	.030	.034	.043	.050	.057	.064	.071	.077
19...	—.012	—.005	.003	.010	.017	.024	.031	.039	.046	.053	.060	.067	.074	.082
20...	—.012	—.005	.003	.010	.018	.025	.033	.041	.048	.056	.063	.071	.078	.086
21...	—.013	—.005	.003	.011	.019	.027	.035	.043	.051	.058	.066	.074	.082	.090
22...	—.014	—.005	.003	.011	.020	.028	.036	.045	053	.061	.070	.078	.086	.095
23...	—.014	—.006	.003	.012	.021	.029	.038	.047	.055	.064	.073	.081	.090	.099
24...	—.015	—.006	.003	.012	.021	.031	.040	.049	.058	.067	.076	.085	.094	.103
25...	—.015	—.006	.003	.013	.022	.032	.041	.051	.060	.070	.079	.088	.098	.107
26...	—.016	—.006	.004	.013	.023	.033	.043	.053	.063	.072	.082	.092	.102	.112
27...	—.017	—.006	.004	.014	.024	.034	.045	.055	.065	.075	.085	.096	.106	.116
28...	—.017	—.007	.004	.014	.025	.036	.046	.057	.067	.078	.089	.099	.110	.120
29...	—.018	—.007	.004	.015	.026	.037	0048	.059	.070	.081	.092	.103	.114	.125
30...	— 019	—.007	.004	.015	.027	.038	.050	.061	.072	.084	.095	.106	.119	.129
31...	—.019	—.007	.004	.016	.028	.039	.051	.063	.075	.086	.098	.110	.121	.133
32...	—.020	—.007	.004	.017	.029	.041	.053	.065	.077	.089	.101	.113	.125	.137
33...	—.020	—.008	.005	.017	.030	.042	.054	.067	.079	.092	.104	.117	.129	.142
34...	—.021	—.008	.005	.018	.030	.043	.056	.069	.082	.095	.107	.120	.133	.146
35...	—.022	—.008	.005	.018	.031	.045	.058	.071	.084	.097	.111	.124	.137	.150
36...	—.022	—.009	.005	.019	.032	.046	.059	.073	.087	.100	.114	.127	.141	.155
37...	—.023	—.009	.005	.019	.033	.047	.061	.075	.089	.103	.117	.131	.145	.159
38...	—.023	—.009	.005	.020	.034	.048	.063	.077	.094	.106	.120	.135	.149	.163
39...	—.024	—.009	.005	.020	.035	.050	.064	.079	.094	.199	.123	.138	.153	.168
40...	—.025	—.010	.006	.021	.036	.051	.066	.081	.096	.111	.126	.142	.157	.172

TABLE C.—*Dew-point and absolute humidity.*

[Grains per cubic foot.]

Dew-point..	0	1	2	3	4	5	6	7	8	9
−30......	.131	.124	.117	.111	.105	.099	.094	.089	.084	.080
−20......	.219	.208	.198	.188	.179	.170	.161	.153	.145	.138
−10......	.356	.340	.324	.309	.294	.280	.267	.254	.242	.230
− 0......	.565	.540	.516	.493	.471	.450	.430	.410	.391	.373
+ 0......	.665	.591	.618	.646	.675	.705	.736	.767	.800	.835
10......	.837	.911	.950	.991	1.033	1.077	1.122	1.169	1.218	1.268
20......	1.320	1.374	1.431	1.489	1.549	1.611	1.676	1.743	1.812	1.883
30.. ...	1.957	2.034	2.113	2.195	2.280	2.367	2.457	2.550	2.645	2.746
40......	2.839	2.955	3.065	3.178	3.295	3.415	3.539	3.668	3.801	3.937
50......	4.077	4.223	4.373	4.527	4.686	4.850	5.018	5.192	5.371	5.526
60......	5.746	5.942	6.143	6.350	6.564	6.784	7.010	7.243	7.482	7.728
70......	7.981	8.241	8.509	8.784	9.067	9.358	9.637	9.964	10.279	10.603
80......	10.936	11.278	11.628	11.988	12.358	12.737	13.127	13.529	13.941	14.362
90.....	14.794	15.238	15.693	16.160	16.637	17.128	17.631	18.146	18.674	19.216
100......	19.771	20.340	20.922	21.518	22.129	22.756	23.397	24.053	24.725	25.413
110......	26.118	26.839	27.576	28.330	29.102	29.894	30.706	31.528	32.374	33.238
120......	34.124	35.026	35.951	36.895	37.860	38.847	39.855	40.884	41.937	40.013

TABLE D.—*Correction to be applied to barometer with brass scales, extending from the cistern to the top of the mercurial column, to reduce the observation to 30° Fahrenheit.*

Temperature.	Inches.														
	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0
°	+	+	+	+	+	+	+	+	+	+	+	+	+	+	–
0	.061	.063	.064	.065	.067	.068	.069	.071	.072	.073	.074	.076	.077	.078	.080
1	.059	.061	.062	.063	.064	.065	.067	.068	.069	.071	.072	.073	.074	.076	.077
2	.057	.058	.060	.061	.062	.063	.064	.066	.067	.068	.069	.070	.072	.073	.074
3	.055	.056	.057	.058	.060	.061	.062	.063	.064	.065	.067	.068	.069	.070	.071
4	.053	.054	.055	.056	.057	.058	.059	.061	.062	.063	.064	.065	.066	.067	068
5	.051	052	.053	.054	.055	.056	.057	.058	.059	.060	.061	.062	.063	.065	.066
6	.049	.050	.051	.052	.053	.054	.055	.056	.057	.058	.059	.060	061	.062	.063
7	.046	.047	.048	.049	.050	.051	.052	.053	.054	.055	.056	.057	.058	059	.060
8	.044	.045	.046	.047	.048	.049	.050	.051	.052	.053	.055	.054	.055	.056	.057
9	.042	.043	.044	.045	.046	.046	.047	.048	.049	.050	.051	.052	.053	.054	.054
10	.040	.041	.042	.042	.043	.044	.045	.046	.047	.047	.048	.049	.050	.051	.052
11	.038	.039	.039	.040	.041	.042	.042	.043	.044	.045	.046	.046	.047	.048	.049
12	.036	.036	.037	.038	.039	.039	.040	.041	.042	.043	.043	.044	.045	.045	.046
13	.033	.034	.035	.036	.036	.037	.038	.038	.039	.040	.040	.041	.042	.043	.043
14	.031	.032	.033	.033	.034	.035	.035	.036	.037	.037	.038	.038	.039	.040	.040
15	.029	.030	.030	.031	.032	.032	.033	.033	.034	.035	.035	.036	.036	.037	.038
16	.027	.028	.029	.029	.029	.030	.030	.031	.032	.032	.033	.033	.034	.034	.035
17	.025	.025	.026	.026	.027	.027	.028	.028	.029	.030	.030	.031	.031	.032	.032
18	.023	.023	.024	.024	.025	.025	.025	.026	.026	.027	.027	.028	.028	.029	.029
19	.021	.021	.021	.022	.022	.023	.023	.024	.024	.024	.025	.025	.026	.026	.027
20	018	.019	.019	.029	.020	.020	.021	.021	.021	.022	.022	023	.023	.023	024
21	.016	.017	.017	.017	.018	.018	.018	.019	.019	.019	.020	.020	.020	.021	.021
22	.014	.014	.015	.015	.015	.016	.016	.016	.016	.017	.017	.017	.018	.018	.018
23	.012	.012	.012	.013	.013	.013	.013	.014	.014	.014	.014	.015	.015	.015	.015
24	.010	.010	.010	.010	.011	.011	.011	.011	.011	.012	.012	.012	.012	.012	.013
25	008	008	.008	.008	.008	.008	.009	.009	.009	.009	.109	.109	.009	.010	.010
26	.005	.006	.002	.006	.006	.006	.006	.006	.006	.006	.007	.007	.007	.007	.007
27	.003	.003	.003	.003	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004
28	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001
29	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001
30	.003	.003	.003	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004
31	.005	.006	.006	.006	.006	.006	.006	.006	006	.007	.007	.007	.007	.007	.007
32	.008	.008	.008	.008	.008	.008	.009	.009	.009	.009	.009	009	.009	.010	.010
33	.010	.010	.010	.010	.011	.011	.011	.011	.012	.012	.012	.012	.012	.012	.012
34	.012	.012	.012	.013	.013	.013	.014	.014	.014	.014	.015	.015	.015	:015	.015
35	.014	.014	.015	.015	.015	.015	.016	.016	.016	.017	.017	.017	.018	.018	.018
36	.016	.017	.017	.017	.017	.018	.018	.019	.019	.019	.020	.020	.020	.021	.021
37	.018	.019	.019	.019	.020	.020	.021	.021	.021	.022	.022	.022	.023	022	.024
38	.020	.021	.021	022	.022	.023	.023	.023	.024	.024	.025	.025	.026	.026	.026
39	.023	.023	.024	.024	.024	.025	.025	.026	.026	.027	.027	.028	.028	.029	.029
40	.025	.025	.026	.026	.027	.027	.028	.028	.029	.029	.030	.030	.031	.031	.032
41	.027	.027	.028	.029	.029	.030	.030	.031	.031	.032	.033	.033	.034	.034	.035
42	.029	.030	.030	.031	.031	.032	.033	.033	.033	.034	.034	.036	.036	.037	.037
43	.031	.032	.032	.033	.034	.034	.035	.036	.036	.037	.038	.038	.039	.040	.040
44	.033	.034	.035	.035	.036	.037	.037	.038	.039	.040	.040	.041	.042	.042	.043

TABLE D—Continued.

Temperature.	Inches.														
	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0
°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	.035	.036	.037	.038	.038	.039	.040	.041	.041	.042	.043	.044	.044	.045	.046
46	.038	.038	.039	.040	.041	.042	.042	.043	.044	.045	.045	.046	.047	.048	.049
47	.040	.041	.041	.042	.043	.044	.045	.046	.046	.047	.048	.049	.050	.051	.051
48	.042	.043	.044	.045	.045	.046	.047	.048	.049	.050	.051	.052	.052	.053	.054
49	.044	.045	.046	.047	.048	.049	.050	.050	.051	.052	.053	.054	.055	.056	.057
50	.046	.047	.048	.049	.050	.051	.052	.053	.054	.055	.056	.057	.058	.059	.060
51	.048	.049	.050	.051	.052	.053	.054	.055	.056	.057	058	.059	.060	.061	.062
52	.050	.052	.053	.054	.055	.056	.057	.058	.059	.060	.061	.062	.063	.064	.065
53	.053	.054	.055	.056	.057	.058	.059	.060	.061	.063	.064	.065	.066	.067	.068
54	.055	.056	.057	.058	.059	.060	.062	.063	.064	.065	.066	.067	.068	.070	.071
55	.057	058	.059	.060	.062	.063	.064	.065	.066	.068	.069	.070	.072	.072	.073
56	.059	.060	.061	.063	.064	.065	.066	.068	.069	.070	.071	.073	.074	075	.076
57	.061	.062	.064	.065	.066	.068	.069	.070	.071	.073	.074	.075	.076	.078	.079
58	.063	.065	.066	067	.069	.070	.071	.073	.074	.075	.077	.078	.079	.081	.082
59	.065	.067	.068	.070	.071	.072	.074	.075	.076	.078	.079	.080	.082	.083	.085
60	.068	.069	.070	.072	073	.075	.076	.077	.079	.080	.082	.083	.085	.086	.087
61	.070	.071	073	.074	.075	.077	.078	.080	.081	.083	.084	.086	.087	.089	.090
62	.072	.073	.075	.076	.078	.079	.081	.082	.084	.085	.087	.088	.090	.091	.093
63	.074	.079	.077	.079	.080	.082	.083	085	.086	.088	.089	.091	.093	.094	.096
64	.076	.078	.079	.081	.082	.084	.086	.087	.089	.090	092	.094	.095	.097	.098
65	.078	.080	.082	.083	.085	.086	.088	.090	.091	.093	.095	.096	.098	.100	.101
66	.080	.082	.084	.085	.087	.089	.090	.092	.094	.096	.097	.099	.101	.102	.104
67	.083	.084	.086	088	.089	.091	.093	.095	.096	.098	.100	.102	.103	.105	.107
68	.085	.086	.088	.090	.092	.094	.095	.097	.099	.101	.102	.104	.106	.108	.109
69	.087	.089	.090	.092	.094	.096	.098	.100	.101	.103	.105	.107	.109	.110	.112
70	.089	.091	.093	.095	.096	.098	.100	.102	.104	.106	.108	.109	.111	.113	.115
71	.091	.093	.095	.097	.099	.101	.102	.104	.106	.108	.110	.112	.114	.116	.118
72	.093	.095	.097	.099	.101	.103	.105	.107	.109	.111	.113	.115	.117	.119	.120
73	.095	.097	.099	.101	.103	.105	.107	.109	.111	.113	.115	.117	.119	.121	.123
74	.097	.099	.102	.104	.106	.108	.110	.112	.114	.116	.118	.120	.122	.124	.126
75	.100	.102	.104	.106	108	.110	.112	.114	.116	.118	.120	.122	.125	.127	.129
76	.102	.104	.106	.108	.110	.112	.114	.117	.119	.121	.123	.125	.127	.129	.131
77	.104	.106	.108	.110	.112	.116	.117	.119	.121	.123	.126	.128	.130	.132	.134
78	.106	.108	.110	.113	.115	.117	.119	.122	.124	.126	.128	.130	.133	.135	.137
79	.108	.110	.113	.115	.117	.119	.122	.124	.126	.128	.131	.133	.135	.137	.140
80	.110	.113	.115	.117	.119	.122	.124	.126	.129	.131	.133	.136	.138	.140	.142
81	.112	.115	.117	.119	.122	.124	126	129	.131	.134	.136	.138	.141	.143	.145
82	.114	.117	.119	.122	.124	.126	.129	.131	.134	.136	.138	.141	.143	.146	.148
83	.117	.119	.121	.124	.126	.129	.131	.134	.136	.139	.141	.143	.146	.148	.151
84	.119	.121	.124	.126	.129	.131	.134	.136	.139	.141	.144	.146	.149	.151	.154
85	.121	.123	.126	.128	131	.133	.136	.139	.141	.144	.146	.249	.151	.154	.156
86	.123	.126	.128	.131	.133	.136	.138	.141	.144	.146	.149	.151	.154	.156	.159
87	.125	.128	.130	.133	.136	.138	.141	.143	.146	.149	.151	.154	.157	.159	.162
88	.127	.130	.133	.135	138	.141	.143	.146	.149	.151	.154	.157	.159	.162	.165
89	.129	.132	.135	.137	.140	.143	.146	.148	.151	.154	.156	.159	.162	.165	.167
90	.131	.134	.137	.140	.142	.145	.148	.151	.153	.156	.159	.162	.164	.167	.170
91	.134	.136	.139	.142	.145	.148	.150	.153	.156	.159	.162	.165	.167	.170	.173
92	.136	.139	.141	.144	.147	.150	.153	.156	.158	.161	.164	.167	.170	.172	.175
93	.138	.141	.144	.147	.149	.152	.155	.158	.161	.164	.167	.170	.172	.175	.178
94	.140	.143	.146	.149	.152	.155	.157	.161	.163	.166	.169	.172	.175	.177	.180

TABLE D—Continued.

Temperature.	Inches.														
	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0
°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	.142	145	.148	.151	.154	.157	.160	.163	.166	.169	.172	.175	.178	.180	.185
96	.144	.147	.150	.153	.156	.159	.162	.165	.168	.171	.174	.178	.181	.183	.188
97	.146	.149	.152	.156	.159	.162	.165	.168	.171	.174	.177	.180	.183	.186	.189
98	.148	.152	.155	158	.161	.164	.167	.170	.173	.176	.179	.183	.186	.188	.191
99	.151	.154	.157	.160	.163	.166	.169	.173	.176	.179	.182	.185	.188	.191	.194
100	.153	.156	.159	.162	.165	.169	.172	.175	.178	.181	.184	.188	.191	.194	.197

TABLE E.—*Table for reducing observations of the barometer to sea-level, correction additive.*

Height in feet.	Temperature of external air—degrees Fahrenheit.												
	—20°	—10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
10	.013	.013	.012	.012	.012	.012	.011	.011	.011	.011	.010	.010	.010
20	.026	.025	.025	.024	.023	.023	.023	.022	.022	.021	021	.020	.020
30	.039	.038	.037	.036	.035	.034	.034	.033	.032	.032	.031	.030	.030
40	.052	.050	.049	.048	.047	.046	.045	.044	.043	.042	.041	.040	.040
50	.065	.063	.061	.060	.059	.058	.056	.055	.054	.053	.052	.051	.050
60	.077	.076	.074	.072	.070	.069	.068	.066	.065	.063	.062	.061	.059
70	.090	088	.086	084	.082	.081	.078	.077	.076	.074	.072	.071	.069
80	.103	.101	.098	.096	.094	.092	.090	.088	.086	.084	.082	.081	.079
90	.116	.113	.111	.108	.105	.104	.101	.099	.097	.095	.093	.091	.089
100	.129	.126	.123	.120	.117	.115	.112	.110	.108	.105	.103	.101	.099
110	.142	.139	.135	.132	.129	.126	.123	.121	.119	.116	.113	.111	.109
120	.155	.151	.148	.144	.140	.138	.134	.132	.128	.126	.124	.121	.119
130	.168	.164	.160	.156	.152	.149	.146	.143	.140	.137	.134	.131	.129
140	.181	.176	.172	.168	.164	.161	.157	.154	.151	.147	.144	.141	.139
150	.194	.189	.185	.180	.176	.172	.168	.165	.162	.158	.155	.152	.149
160	.206	.201	.197	.192	.187	.183	.179	.176	.172	.168	.165	.162	.158
170	.219	.214	.209	.204	.199	.195	.190	.187	.183	.179	.175	.172	.168
180	.232	.227	.222	.216	.211	.206	.202	.198	.194	.189	.185	.182	.178
190	.245	.239	.234	.228	222	.218	.213	.209	.204	.200	.196	.192	.188
200	.258	.252	.246	.24	.234	.229	.224	.220	.215	.210	.206	.202	.198
210	.271	.264	.258	.252	.246	.240	.235	.231	.226	.221	.216	.212	.208
220	.284	.277	.270	.264	.257	.252	.246	.242	.236	.231	.227	.222	.218
230	.296	.289	.283	.276	.269	.263	.257	.253	.247	.242	.237	.232	.228
240	.309	.302	.295	.288	.281	.275	.269	.264	.258	.252	.248	.242	.238
250	.322	.314	.307	.300	.293	.286	.280	.275	.269	.263	.258	.253	.248
260	.335	.327	.319	.311	.304	.297	.291	.285	.279	.273	.268	.263	.257
270	.348	.339	.331	.323	.315	.309	.302	.296	.290	.284	.278	.273	.267
280	.360	.352	.344	.335	.328	.320	.314	.307	.301	.294	.288	.283	.277
290	.373	.364	.356	.347	.339	.332	.325	.318	.311	.305	.299	.293	.287
300	.386	.377	.368	.359	.351	.343	.336	.329	.322	.315	.309	.303	.297
310	.399	.389	.380	371	.363	.354	.347	.340	.333	326	.319	.313	.307
320	.412	.402	.392	.383	.374	.366	.358	.351	.343	336	.329	.323	.317
330	.424	.414	.404	.395	.386	.377	.369	.362	.354	.347	.340	.333	.326
340	.437	.427	.416	.407	.397	.389	.380	.373	.365	.357	.350	.343	.336
350	.450	.439	.429	.419	.409	.400	.392	.384	.376	.368	.360	.353	.346
360	.463	.451	.441	.430	.421	.411	.403	.494	.386	.378	.370	.363	.356
370	.476	.464	.453	.442	.432	.423	.414	.405	.397	.389	.380	.376	.366
380	.488	.476	.465	.454	.444	.434	.425	.416	.408	.399	.391	.383	.375
390	.501	.489	.477	.466	.455	.446	.436	.427	.418	.410	.401	.293	.385
400	.514	.501	.489	.478	.467	.457	.447	.438	.429	.420	.411	.403	.395
410	.527	.513	.501	.490	.479	.468	.458	.449	.440	.430	.421	.413	.405
420	.539	.526	.513	.502	.490	.489	.469	.460	.450	.441	.431	.423	.415
430	.552	.538	.525	.513	502	.491	.480	.470	.461	.451	.442	.433	.425
440	.565	.551	.537	.525	.513	.502	.491	.481	.471	.462	.452	.443	.435
450	.578	.563	.550	.537	.525	.513	.503	.492	.482	.472	.462	.453	.444
460	.590	.575	562	.549	.537	.525	.514	.503	.493	.482	.472	.463	.454
470	.603	.588	.574	.561	.548	.536	.525	.514	.503	.493	.482	.473	.464
480	.616	.600	.586	.572	.560	.547	.536	.524	.514	.503	.493	.488	.474
490	.628	613	.598	.584	.571	.559	.547	.535	.524	.514	.503	.493	.483

TABLE E—Continued.

Height in feet.	Temperature of external air—degrees Fahrenheit.												
	—20°	—10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
500	.641	.625	.610	.596	.583	.570	.558	.546	.535	.524	.513	.503	.493
510	.654	.637	.622	.608	.594	.581	.569	.557	.545	.534	.523	.513	.503
520	.666	.650	.634	.620	.606	.593	.580	.568	.556	.545	.533	.523	.513
530	.679	.662	.646	.631	.617	.604	.591	.578	.566	.555	.544	.533	.522
540	.691	.675	.658	.643	.629	.615	.602	.589	.577	.565	.554	.543	.532
550	.704	.687	.670	.655	.640	.626	.613	.600	.587	.575	.564	.553	.542
560	.717	.699	.683	.667	.652	.638	.624	.611	.598	.586	.574	.563	.552
570	.729	.712	.695	.579	.663	649	.635	.622	.608	.596	.584	.573	.562
580	.742	.724	.707	.590	.675	.660	.646	.632	.619	.606	.595	.583	.571
590	.154	.737	.719	.702	.686	.672	.657	.643	.629	.617	.605	.593	.581
600	.767	.749	.731	.714	.698	.683	.668	.654	.640	.627	.615	.603	.591
610	.780	.761	.743	.726	.709	.694	.679	.665	.650	.637	.625	.613	601
620	.792	.774	.755	.738	.721	.705	.690	.675	.661	.648	.635	.623	.611
630	.805	.786	.767	.749	.732	.717	.701	.686	.671	.658	.645	.633	.620
640	.817	.798	.779	.761	.744	.728	.712	.697	.682	.668	.655	.643	.630
650	.830	.811	.791	.773	.755	.739	.723	.708	692	.679	.666	.653	.640
660	.843	.823	.803	.785	.767	.750	.734	718	.703	.689	.676	.662	.650
670	.855	.835	.815	.797	.778	.76	.745	.729	.713	.699	.686	.672	660
680	.868	.847	.827	.808	.790	.773	.756	.740	.724	.709	.696	.682	.669
690	.880	.860	.839	.82	.801	.784	.767	.750	.734	.720	.706	.692	.679
700	.893	.872	.851	.882	.813	.795	.778	.761	.745	.730	.716	.702	689
710	.905	.884	.863	.844	.824	.806	789	.772	.755	.740	.726	.712	.698
720	.918	.896	.875	.855	.836	.817	.800	.782	.766	.751	.636	.722	.707
730	.930	909	.886	.867	.847	.829	.811	.793	.776	.761	.746	.732	.718
740	.943	.921	.899	.879	.859	.840	.822	.804	.787	.771	.756	.742	.728
750	.955	.933	.911	.891	.870	.851	.833	.815	.797	.782	.767	.752	.738
760	.968	.945	.922	.902	.881	862	843	.825	.808	.792	.777	.761	.747
770	.980	.957	.934	.914	.893	.873	.854	.836	.818	.802	.787	.771	.757
780	.993	.970	.046	.926	904	.885	.865	.847	.829	.812	.797	.781	.767
790	1.005	.982	.958	.937	.917	.896	.876	857	.839	.823	.807	.791	.776
800	1.018	.994	970	.949	.927	.907	.887	.868	.850	.833	.817	.801	.786
810	1.030	1.006	.982	.961	.938	.918	.898	.878	.860	.843	.827	.811	.796
820	1.043	1.018	994	.972	.950	.929	909	.889	.871	.854	.837	.821	.805
830	1.055	1.031	1.006	.984	.961	.940	.920	900	.881	.864	.847	.821	.815
840	1.068	1.043	1.043	.995	.873	.951	.931	.911	.892	.874	.857	.841	.825
850	1.080	1.055	1.030	1.007	984	.962	.942	.922	.902	.885	.867	.851	.835
860	1.093	1.067	1.041	1.019	.995	.974	.952	.932	.913	.895	.877	.860	.844
870	1.105	1.079	1.053	1.030	1.007	.985	.963	.943	.923	.905	.887	.870	.854
880	1.118	1.092	1.065	1.042	1.018	.996	974	.954	.934	915	.897	.880	.864
890	1.130	1.101	1.077	1.053	1.030	1.007	.985	.964	.944	.926	.907	.890	.873
900	1.143	1.116	1.089	1.065	1.041	1.018	996	.975	.955	936	.917	.900	.883
910	1.155	1.128	1.101	1.077	1.052	1.029	.007	.986	.965	.946	.927	.910	.893
820	1.168	1.140	1.113	1.088	1.064	1.040	1.019	.996	.976	.956	.937	.920	.902
930	1.180	1.152	1.125	1.100	1.075	1.051	1.028	1.007	.986	.967	.947	.929	912
940	1.193	1.164	1.137	1.111	1.086	1.062	1.040	1.017	.997	.977	.957	.939	.921
950	1.205	1.177	1.149	1.123	1.098	1.074	1.051	1.028	1.007	.987	.967	.949	.931
960	1.217	1.189	1.160	1.835	1.109	1.085	1.061	1.039	1.017	.997	.977	.959	.841
970	1.230	1.201	1.172	1.146	1.120	1.096	1.072	1.049	1.028	1.007	.987	.969	.950
980	1.242	1.213	1.184	1.158	1.131	1.107	1.083	1.060	1.038	1.018	.997	.978	.960
990	1.255	1.225	1.196	1.169	1.143	1.118	1.094	1.070	1.049	1.028	1.007	.988	.969

TABLE E—Continued.

Height in feet.	Temperature of external air—degrees Fahrenheit.												
	−20°	−10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
1,000	1.267	1.237	1.208	1.181	1.154	1.129	1.105	1.081	1.059	1.038	1.017	.998	.979
1,010	1.279	1.249	1.220	1.192	1.165	1.140	1.116	1.092	1.069	1.048	1.027	1.008	0.989
1,020	1.292	1.261	1.232	1.204	1.177	1.151	1.127	1.102	1.080	1.058	1.037	1.018	0.998
1,038	1.304	1.273	1.243	1.215	1.188	1.162	1.137	1.113	1.090	1.069	1.047	1.027	1.008
1,040	1.317	1.285	1.255	1.227	1.199	1.173	1.148	1.123	1.101	1.079	1.057	1.037	1.017
1,050	1.329	1.298	1.267	1.238	1.211	5 184	1.159	1.134	1.111	1.089	1.067	1.047	1.027
1,060	1.341	1.310	1.279	1.550	1.222	1.195	1.170	1.145	1.121	1.099	1.077	1.057	1.037
1,070	1.354	1.322	1.291	1.261	1.233	1.206	1.181	1.155	1.132	1.109	1.087	1.067	1.046
1,080	1.366	1.334	1.302	1.273	1.244	1.217	1.191	1.166	1.142	1.120	1.097	1.076	1.056
1,090	1.379	1.346	1.314	1.284	1.256	1.128	1.202	1.176	1.153	1.130	1.107	1.086	1.065
1,100	1.391	1.358	1.326	1.296	1.267	1.239	1.213	1.187	1.163	1.140	1.117	1.096	1.075
1,110	1.403	1.370	1.338	1.307	1.278	1.250	1.224	1.198	1.173	1.150	1.127	1.106	1.085
1,120	1.416	1.382	1.350	1.319	1.289	1.261	1.235	1.208	1.184	1.160	1.137	1.115	1.094
1,130	1.428	1.394	1.361	1.330	1.301	1.272	1.245	1.219	1.194	1.170	1.147	1.125	1.104
1,140	1.440	1.406	1.373	1.342	1.312	1.288	1.256	1.229	1.204	1.180	1.157	1.135	1.113
1,150	1.453	1.418	1.385	1.353	1.323	1.294	1.267	1.240	1.215	1.191	1.167	1.145	1.123
1,160	1.465	1.430	1.397	1.365	1.334	1.305	1.278	1.251	1.225	1.201	1.177	1.154	1.133
1,170	1.477	1.442	1.409	1.376	1.345	1.315	1.289	1.261	1.235	1.211	1.187	1.164	1.142
1,180	1.489	1.454	1.420	1.388	1.357	1.327	1.299	1.272	1.245	1.221	1.197	1.174	1.152
1,190	1.502	1.466	1.432	1.399	1.368	1.338	1.310	1.282	1.256	1.231	1.207	1.183	1.161
1,200	1.514	1.478	1.444	1.411	1.379	1.349	1.321	1.293	1.266	1.241	1.217	1.193	1.171
1,210	1.526	1.490	1.456	1.422	1.390	1.360	1.332	1.303	1.276	1.251	1.227	1.203	1.180
1,220	1.539	1.502	1.467	1.434	1.401	1.371	1.342	1.314	1.288	1.261	1.237	1.212	1.190
1,230	1.551	1.514	1.479	1.445	1.413	1.382	1.353	1.324	1.297	1.271	1.247	1.222	1.199
1,240	1.463	1.526	1.491	1.457	1.424	1.393	1.364	1.335	1.307	1.281	1.257	1.232	1.209
1,250	1.576	1.538	1.502	1.468	1.435	1.404	1.374	1.345	1.317	1.291	1.266	1.242	1.218
1,260	1.588	1.550	1.514	1.479	1.446	1.415	1.385	1.356	1.328	1.302	1.276	1.251	1.228
1,270	1.600	1.562	1.526	1.491	1.457	1.426	1.396	1.366	1.338	1.312	1.286	1.261	1.237
1,280	1.612	1.574	1.538	1.502	1.469	1.437	1.407	1.377	1.348	1.322	1.296	1.271	1.247
1,290	1.625	1.586	1.549	1.514	1.480	1.448	1.417	1.387	1.359	1.332	1.306	1.280	1.256
1,300	1.637	1.598	1.561	1.525	1.491	1.459	1.428	1.398	1.369	1.342	1.316	1.290	1.266
1,310	1.649	1.610	1.573	1.536	1.502	1.470	1.439	1.408	1.379	1.352	1.326	1.300	1.275
1,320	1.661	1.622	1.584	1.548	1.513	1.481	1.449	1.419	1.390	1.362	1.336	1.309	1.285
1,330	1.674	1.634	1.596	1.559	1.525	1.492	1.460	1.429	1.400	1.372	1.346	1.319	1.294
1,340	1.686	1.646	1.608	1.571	1.536	1.503	1.471	1.440	1.410	1.382	1.356	1.329	1.304
1,350	1.698	1.658	1.620	1.582	1.547	1.514	1.482	1.450	1.420	1.393	1.366	1.339	1.313
1,360	1.710	1.669	1.631	1.593	1.558	1.524	1.492	1.461	1.431	1.403	1.375	1.348	1.323
1,370	1.722	1.681	1.643	1.605	1.569	1.535	1.503	1.471	1.441	1.413	1.385	1.358	1.332
1,380	1.751	1.693	1.655	1.616	1.581	1.546	1.514	1.482	1.451	1.423	1.395	1.368	1.342
1,390	1.747	1.705	1.666	1.628	1.592	1.557	1.524	1.492	1.462	1.433	1.405	1.377	1.351
1,400	1.759	1.717	1.678	1.639	1.603	1.568	1.535	1.503	1.472	1.443	1.415	1.387	1.361
1,410	1.771	1.729	1.690	1.650	1.614	1.579	1.546	1.513	1.482	1.453	1.425	.397	1.370
1,420	1.783	1.741	1.701	1.662	1.625	1.590	1.556	1.524	1.492	1.463	1.435	.406	1.380
1,430	1.796	1.753	1.713	1.673	1.626	1.601	1.567	1.534	1.503	1.473	1.444	1.416	1.389
1,440	1.808	1.765	1.724	1.685	1.647	1.612	1.577	1.545	1.513	1.483	1.454	1.426	1.399
1,450	1.820	1.777	1.736	1.696	1.658	1.623	1.588	1.555	1.523	1.493	1.464	1.436	1.408
1,460	1.832	1.788	1.748	1.707	1.670	1.633	1.599	1.565	1.533	1.503	1.474	1.445	1.418
1,470	1.844	1.800	1.759	1.719	1.681	1.644	1.609	1.576	1.543	1.513	1.484	1.455	1.427
1,480	1.857	1.812	1.771	1.730	1.692	1.655	1.620	1.586	1.554	1.523	1.493	1.465	1.437
1,490	1.869	1.824	1.782	1.742	1.703	1.666	1.630	1.597	1.564	1.533	1.503	1.474	1.446
1,500	1.881	1.836	1.794	1.753	1.714	1.677	1.641	1.607	1.574	1.543	1.513	1.484	1.456

EXPLANATION OF THE FLAG AND WHISTLE SIGNALS

ADOPTED BY THE UNITED STATES WEATHER BUREAU.

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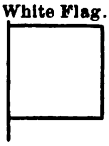
1. The Weather Bureau furnishes, when practicable, for the benefit of the general public and those interests dependent to a greater or less extent upon weather conditions, the "Forecasts" which are prepared at this office daily, at 10 a. m. and 10 p. m. for the following day. These weather forecasts are telegraphed to observers at stations of the Weather Bureau, railway officials, and many others, and are so worded as to be readily communicated to the public by means of flags or steam whistles. The flags adopted for this purpose are five in number, and of the form and dimensions indicated below:

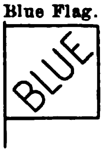
EXPLANATION OF FLAG SIGNALS.

White Flag.



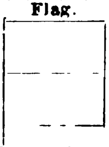
Clear or fair weather.

Blue Flag.



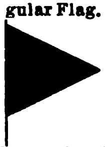
Rain or snow.

White and blue Flag.



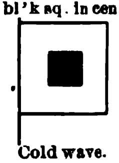
Local rains.

Black Triangular Flag.



Temp. signal.

White Flag, bl'k sq. in cen.



Cold wave.

Number 1, white flag, six feet square, indicates clear or fair weather. Number 2, blue flag, six feet square, indicates rain or snow. Number 3, white and blue flag (parallel bars of white and blue), six feet square, indicates that local rains or showers will occur, and that the rain-fall will not be general. Number 4, black triangular flag, four feet at the base and six feet in length, always refers to temperature; when placed above numbers 1, 2, or 3, it indicates warmer weather; when placed below numbers 1, 2, or 3, it indicates colder weather; when not displayed, the indications are that the temperature will remain stationary, or that the change in temperature will not vary more than four degrees from the temperature of the same hour of the preceding day from March to October, inclusive, and not more than six degrees for the remaining months of the year. Number 5, white flag, six feet square, with black in center, indicates the approach of a sudden and decided fall in temperature. This signal is not to be displayed unless it is expected that the temperature will fall to forty-two degrees, or lower, and is usually ordered at least twenty.four hours in advance of the cold wave. When number 5 is displayed, number 4 is always omitted.

2. When displayed on poles the signals should be arranged to read downward; when displayed from horizontal supports a small streamer should be attached to indicate the point from which the signals are to be read.

INTERPRETATION OF DISPLAYS.

No. 1, alone, indicates fair weather, stationary temperature.
No. 2, alone, indicates rain or snow, stationary temperature.
No. 3, alone, indicates local rain, stationary temperature.
No. 1, with No. 4 above it. indicates fair weather, warmer.
No. 1, with No. 4 below it, indicates fair weather, colder.
No. 2, with No. 4 above it, indicates warmer weather, rain or snow.
No. 2, with No. 4 below it, indicates colder weather, rain or snow.
No. 3, with No. 4 above it, indicates warmer weather with local rains.
No. 3, with No. 4 below it, indicates colder weather with local rains.
No. 1, with No. 5 above it, indicates fair weather, cold wave.
No. 2, with No. 5 above it, indicates wet weather, cold wave.

EXPLANATION OF WHISTLE SIGNALS.

3. NOTE.—The warning signal, to attract attention, will be a long blast of from fifteen to twenty seconds duration. After this warning signal has been sounded, long blasts (of from four to six seconds duration) refer to weather, and short blasts (of from one to three seconds duration) refer to temperature; those for weather to be sounded first.

Blasts.	Indicate.
One long	Fair weather
Two long	Rain or snow
Three long	Local rains
One short	Lower temperature
Two short	Higher temperature
Three short	Cold wave

INTERPRETATION OF COMBINATION BLASTS.

One long, alone	Fair weather, stationary temperature.
Two long, alone	Rain or snow, stationary temperature.
One long and one short	Fair weather, lower temperature
Two long and two short	Rain or snow, higher temperature.
One long and three short	Fair weather, cold wave
Three long and two short	Local rains, higher temperature

(By repeating each combination a few times, with an interval of ten seconds between, possibilities of error in reading the forecasts will be avoided, such as may arise from variable winds, or failure to hear the warning signal.)

4. As the weather forecasts are telegraphed daily to a large number of stations of the Weather Bureau, to railroads, etc., in various sections of the country, there are many small towns which may obtain them by telephone, free of expense; they may also be obtained from the Associated Press dispatches published in the daily newspapers. Those desiring to display or sound the signals, and who are not able to obtain the forecasts as above, should communicate direct with the director of the State Weather Service, or with this office, when, if practicable, the predictions will be telegraphed to them at the expense of the Weather Bureau; and if it is impracticable for the United States to bear the expense of transmission, they will be furnished at the regular commercial rates and sent "collect."

5. In no case will both a. m. and p. m. forecasts be sent to the same address at government expense; nor will the telegrams be sent to more than one person, or firm, in any one place, except at the expense of the applicant.

6. Flag weather signals are displayed at many stations throughout the United States, and this improved system has been adopted with the view of securing uniformity, and is recommended after a careful test. The method is not complicated; the solid colors insure legibility, and the flags may be obtained at small expense, or, if desired, material may be procured and the symbols be of home manufacture, no restriction being placed upon the size of the flags used, so long as they conform to the system above outlined but no flags should be less than six feet square.

7. The system of whistle signals may be utilized to better advantage in many places where flags could not be seen at long distances, due notification having been given to the surrounding community through the press and otherwise that, at a designated hour, the steam whistle at a certain place will sound the signal to indicate the probable weather and temperature for the ensuing twenty-four hours.

8. The flag displays here outlined may be greatly extended and become one of the most valuable aids to farmers, shippers, and the public generally, by a little exertion and a small outlay for flags on the part of those who would be benefited. The system has been adopted and is in use by some of the principal railroads throughout the country—the symbols, made of tin or sheet iron, being displayed from the baggage cars. These roads transmit over their wires each

morning, to points from which trains start, the names of the symbols to be displayed, the baggage-masters at those points attaching them. When the symbols are displayed on the cars they should be placed one above the other and read downward. Many large firms and corporation are exhibiting flags, and at the same time advertising their business by printing the signals and their meanings on the back of their business cards.

COLD WAVE AND FROST WARNINGS.

The Chief of the Weather Bureau is desirous of extending the usefulness of the service in giving a wider dissemination to the cold wave and frost warnings in the agricultural and commercial interests of the country so that all interests liable to be affected by cold weather or rapid falls in temperature may be able to take the necessary precautions by being informed of the coming cold waves or the occurrence of frost.

The display of the cold wave flag (white flag with a black square in center) indicates that there will be a sudden and decided fall in temperature, amounting to sixteen degrees, or more, depending on locality —greater falls being required to justify a display in the western and northwestern States and territories than in the Atlantic and Gulf States. The fall should occur within twenty-four or thirty-six hours. The display of the flag during the growing season indicates that injury to vegetation may be expected from frost, and at other times that the cold may prove injurious to stock, and to farm products, etc., exposed in shipment.

The warnings will usually be issued for a period of twenty-four hours in advance of the anticipated cold wave or frost. Pronounced cold waves may at times be foretold forty-eight hours in advance.

The cold-wave flag will be lowered at the expiration of the time mentioned in the order to hoist, unless a second warning is received.

The flag should be at least six feet square if displayed from a staff or building 35 to 50 feet high, and for a taller staff or building a larger flag should be used.

In the State of Florida, and in a strip of country one hundred miles wide on the upper Gulf coast, and along the Pacific coast, the cold-wave warnings will be replaced by frost warnings, and the cold-wave flag will be known as the frost-warning flag. During the late spring and early fall the cold-wave flag is also used as a frost-warning flag in other portions of the country to indicate anticipated frosts.

LIST OF STATIONS

To which the Daily Weather Forecast Messages have been Telegraphed During the Whole or a Part of 1890.

Station.	County.	Displayman.
Adrian	Bates	Dr. H. W. Tuttle
Appleton City	St. Clair	Charles Hilton, J. R. Hopkins
Bolivar	Polk	Dan. C. Farrar
Boonville	Cooper	W. Speed Stephens
Brookfield	Linn	W. C. Walker, Prof. L. A. Wirick
Brunswick	Chariton	Louis Benecke
Carrollton	Carroll	Pettit & Welch
Carthage	Jasper	A. B. Ellison
Cassville	Barry	George E. Harris
Charleston	Mississippi	Malcolm V. Golder
Chillicothe	Livingston	M. E. Schmidt, N. J. Swetland & Co.
Columbia	Boone	George W. Henderson
Craig	Holt	Charles F. A. Day
Excelsior Springs	Clay	A. Reinisch
Fayette	Howard	Prof. T. Berry Smith
Fordland	Webster	J. H. Williams
Fulton	Callaway	G. D. Morris
Harris	Sullivan	Prof. Charles C. Swafford
Harrisonville	Cass	B. F. Flora, F. J. Clarke
Jackson	Cape Girardeau	William Paar
Jefferson City	Cole	Northrup & Co
Kansas City	Jackson	P. Connor
Keytesville	Chariton	A. F. Tooley
Kidder	Caldwell	F. D. Chubbuck, S. S. Stahl
Lamar	Barton	E. H. Adams
Lebanon	Laclede	H. T. Wright
Lexington	Lafayette	W. B. Powell, L. R. Kaufman
Liberty	Clay	Prof. J. R. Eaton
Marshfield	Webster	Frederick King
Maryville	Nodaway	W. J. Staples
Mexico	Audrain	R. M. White
Monett	Barry	J. C. Lipes
Nevada	Vernon	R. B. Speed
New Haven	Franklin	Max Eimbeck
New Madrid	New Madrid	Seth. S. Barnes
Potosi	Washington	W. T. Woolford
Princeton	Mercer	Dr. William Hirons
Richmond	Ray	B. G. Shackelford
Rolla	Phelps	H. E. Baker
St. Charles	St. Charles	Vinke Bros
St. Louis		W. H. Hammon
Salisbury	Chariton	J. H. Wayland, M. R. Williams
Sarcoxie	Jasper	C. B. Armstrong
Shelbina	Shelby	John S. Chandler
Sikeston	Scott	George P. McCoy
Springfield	Greene	T. S. Collins
Stanberry	Gentry	M. B. Tomblin
Steelville	Crawford	Capt. E. A. Pinnall
Tarkio	Atchison	W. W. Murchie, Prof. J. C. Adair
Thayer	Oregon	P. W. Moss, Jr
Tipton	Moniteau	S. W. Hurst
Warrensburg	Johnson	W. G. Wood, Pres. G. L. Osborne
Washington	Franklin	H. Wellenkamp
Wyaconda	Clarke	W. W. Weber

WEATHER CROP BULLETIN.

The Weekly Weather Crop Bulletin for Missouri was issued by the State Board of Agriculture, in co-operation with the U. S. Signal Service, every Saturday, from March 15 to November 1, 1890. This bulletin is made up from reports received by mail at the Central Office at Columbia, Friday night and Saturday morning, from correspondents situated in all sections of the State, and gives the conditions of temperature, sunshine and rain-fall that have prevailed during the past week, and the effect they have exerted upon the growing crops. The acreage, condition and probable yield of the different crops are also given from time to time, so that any one can form an opinion for himself as to what the supply and demand for a given crop will be. The interest taken by the people of the State in this bulletin may be seen from the following statement: Five hundred copies of the bulletin were issued each week and furnished to the correspondents, to business firms and to the press. It was published in full or in part in 124 weekly and agricultural newspapers of the State, and in 13 agricultural newspapers outside of the State; and after the first of July it was telegraphed to the daily papers of the State by the Associated Press.

The growing popularity of this bulletin has caused the facilities for its issue to be greatly increased, so that for the next season it can be more widely distributed. The collection and tabulation of the climatological data of the State will also furnish a definite standard for comparison, so that in the future this bulletin can be made still more useful to those who will avail themselves of the information that it will contain.

LIST OF REPORTERS FOR THE WEATHER CROP BULLETIN

For 1890—By counties.

Adair:
- J. E. Stuckey, Millard.
- John Shibley, Shibley's Point.

Andrew:
- Benj. Petrie, Fillmore.
- Newton Bird, Avenue City.
- S. K. Faulkner, Whitesville.

Audrain:
- Mrs. C. R. Gamble, Mexico.

Barry:
- T. P. Withers, Monett.

Barton:
- Dr. A. B. Stone, Iantha.
- Owen Blacker, Esrom.
- D. T. McGown, Golden City.

Bates:
- H. O. Haynes, Rockville.
- Henry Speer, Butler.
- Dr. H. W. Tuttle, Adrian.

Benton:
- J. R. Jones, Warsaw.
- J. R. Caldwell, Fort Lyon.
- F. L. Feaster, Fairfield.

Bollinger:
- George E. Conrad, Marble Hill.
- Jacob J. Conrad, Marble Hill.
- Henry J. Murray, Sedgwickville.

Boone:
- George W. Henderson, Columbia.
- George M. Pipes, Rocheport.
- G. S. Martin, Ashland.

LIST OF REPORTERS—Continued.

Buchanan:
William M. Matney, Platte River.

Butler:
John Enderby, Shiloh.
George W. Register, Poplar Bluff.

Caldwell:
John P. Platt, Kingston.
Samuel E Turner, Bonanza.
D. C. Wells, Catawba.

Callaway:
J. L. Erwin, Fulton.
Robert Newson, Caldwell.

Cape Girardeau:
Henry Bruihl, Oak Ridge.
L. M. Bean, Gordonville.

Carroll:
Marion Shirley, Bogard.
J. J. Brown, Bosworth.
Pettit & Welch, Carrollton.
L. E. Dorsey, Stet.

Carter:
Silas Pace, Elsimore.
J. B. Stephens, Elsimore.

Cass:
A. J. Sharp, Harrisonville.
D. H. Webster, Austin.
W. H. Barrett, Harrisonville.

Cedar:
J. W. May, Virgil City.
O. K. Dodderer, Virgil City.

Chariton:
M. K. Williams, Salisbury.

Christian:
H F. Davis, Cassidy.
W. H. H. Miller, Ozark.

Clark:
———, Alexandria.

Clay:
J. C. Evans, Harlem.
J. T. Marr, Liberty.

Clinton:
W. L. Culver, Grayson.
A. C. Cook, Plattsburg.

Cole:
J. A. Elston, Elston.
J. A. Hunter, Hickory Hill.

Cooper:
A. J. Zeigel, New Palestine.
- ——, Boonville.

Crawford:
L D. Grover, Cuba.
W. J. Parker, Berryman.

Dade:
S. E. Shaw, Seybert.
B. M. Neale, Ernest.

Dallas:
Frank Fowler, Buffalo.
N. J. Wollard, Charity.

Daviess:
F. B. Staats, Jamesport.

DeKalb:
H C. Burnham, Fairport.

Dent:
J. E. Organ, Salem.
B. A. Hedrick, Anutt.

Douglas:
Henry Klineline, Ava.

Franklin:
H. Wellenkamp, Washington.
A. C. Krag, Washington.
George H. Ross, Labadie.

Gasconade:
Charles Maushund, Hermann.
S. W. Maushund, Hermann.
W. H. Taylor, Bem.
Charles W. Mellier, Woollan.

Gentry:
I. N. Morris, Stanberry.
Charles G. Comstock, Albany.

Greene:
M. O. Bedell, Hickory Barrens.

Grundy:
J. M. Robb, Dunlap.
H. C. Crooks, Galt.

Harrison:
W. H. Bolar, Bethany.
L. P. Riley, Andover.
Albert Reeves, Ridgeway.
Newburn & Co., Bethany.

Henry:
Lingle Bros., Clinton.
Thomas Day, Lewis Station.

LIST OF REPORTEES—Continued.

HICKORY:
M. N. Neihardt, Hermitage.
W. H. Liggett, Wheatland.

HOLT:
William Kaucher, Oregon.
Charles F. A. Day, Craig.
S. H. Hodge, Maitland.
Peter Dearmont, Mound City.

HOWARD:
T. Berry Smith, Fayette.
John E. Ewin, Fayette.

HOWELL:
E. F. Hynes, West Plains.
E. C. Ferguson, Willow Springs.
T. E. Tabor, Pottersville.

IRON:
W. H. Delano, Ironton.
J. P. Russell, Ironton.
John R. Adams, Goodland.
Edwin May, Annapolis.

JACKSON:
S. J. Spurgeon, Kansas City.
H. C. Chiles, Independence.
Jacob Sweaney, Red Bridge.

JASPER:
D R. Goucher, Carthage.
C. B. Armstrong, Sarcoxie.

JEFFERSON:
T. W. Guy, Kimmswick.
W. S. Jewett, Crystal City.

JOHNSON:
S. I. Workman, Knob Noster.
J. P. Ozias, Centreview.
George L. Osborne, Warrensburg.
Wm. Mohler, Warrensburg.

KNOX:
J. D. McFarland, Edina.

LACLEDE:
J. I. Smith, Phillipsburg.

LAFAYETTE:
J. T. Ferguson, Bates City.
Henry Miller, Concordia.
William T. Gammon, Odessa.

LAWRENCE:
J. L. Wright, Peirce City.
I. L. Smith, Chesapeake.

LEWIS:
Newton Childress, Canton.
S. M. Finley, LaGrange.
J. C. Ammerman, Lewiston.

LINCOLN:
Fred L. Jabin, Big Creek, near Troy.

LINN:
J. H. Patterson, Meadville.
James Sanderson, Marceline.

LIVINGSTON:
Scruby Bros., Chillicothe.
John A. Lowe, Chillicothe.

McDONALD:
J. P. Lamance, Splitlog.

MACON:
C. W. McJilton, Atlanta.
Grant Goodson, New Cambria.

MADISON:
Jacob Lutes, Marquand.

MARIES:
M. Williams, Maries.
Linden Marts, Grovedale.

MARION:
J. R. Dudley, Withers' Mill.
A. S. Smith, Hannibal.

MERCER:
Dr. William Hirons, Princeton.
W. E. Peters, Pleasanton, Iowa.
J. A. Kennedy, Ravanna.

MILLER:
N. J. Shepherd, Eldon.
Samuel Newton, Eldon.

MISSISSIPPI:
Malcolm V. Golder, Charleston.
Dr. A. Parker, Bertrand.

MONITEAU:
R. Q. Roache, California.
Lorenzo Frost, Jamestown.

MONROE:
J. M. Proctor, Monroe City.
R. Manning Walker, Monroe City.
F. P. Vaughn, Paris.
W. T. Forsyth, Strother.

MONTGOMERY:
John W. Jacks, Montgomery City.

LIST OF REPORTERS—Continued.

MORGAN:
C. C. Merriott, Versailles.

NEWTON:
Dr. J. R. Smith, Neosho.

NODAWAY:
B. L. Cook, Guilford.
H. C. Fleming, Hopkins.
M. B. W. Harman, Pickering.

OREGON:
J. A. Smith, Alton.
P. W. Moss, Jr., Thayer.

OSAGE:
C. H. Dallas, Chamois.
Henry Shrader, Dauphin.

OZARK:
S. A. Beach, Almartha.

PERRY:
C. U. Prost, Perryville.

PETTIS:
Charles G. Taylor, Sedalia.
R. P. Archer, Sedalia.
V. T. Chilton, Smithton.

PIKE:
M. W. Wood, McCune Station.
W. F. Oglesby, Clarksville.

PLATTE:
J. B. Evans, Weston.
M. P. Collins, Platte City.
J. J. Blakely, Platte City.

POLK:
J. F. Roberts, Bolivar.
George L. Tuck, Brighton.
H. M. Wollard, Dunegan.

PULASKI:
J. T. Quinn, Richland.

PUTNAM:
J. W. Patterson, Xenia.
Merritt Young, Allenton, Iowa.

RANDOLPH:
W. H. Broaddus, Darksville.
J. W. Rucker, Higbee.

RAY:
Dr. J. T. Hamilton, Crab Orchard.
A. V. Van Trump, Elmira.

REYNOLDS:
John S. Luthy, Edgehill.
——— Black.

ST. CHARLES:
Dr. J. R. Mudd, St. Charles.
Louis C. Saeger, St. Charles.
R. W. Mueller, Augusta.
L. H. Haigler, Black Walnut.

ST. CLAIR:
Albert Falcon, Appleton City.
William Pence, Tiffin.

ST. FRANCOIS:
H. Sleeth, De Lassus.

ST. LOUIS:
Dr. William Muir, Fox Creek.
August Wengler, Allenton.

STE. GENEVIEVE:
T. B. Whitledge, St. Marys.

SALINE:
Robert Ruxton, Miami.
J. F. Webster, Miami.
T. C. Rainey, Marshall.

SCHUYLER:
John R. Rippey, Glenwood.

SCOTLAND:
A. J. Woods, Crawford Station.
Henry Hanford, Granger.
John W. Pulliam, Gorin.

SCOTT:
Isaac Hunter, Morley.
W. W. Campbell, Commerce.

SHELBY:
John S. Chandler, Shelbina.
J. E. Bishop, Maud.

STODDARD:
T. L. Wilson, Idalia.

STONE:
J. S. Crumpley, Robertson's Mill
H. A. Massey, Galena.

SULLIVAN:
D. H. Sholtus, Milan.
I. Stanforth, Green City.

TANEY:
Silas C. Turnbo, Protem.
John H. Lawrence, Bradleyville.
Ellis E. Decker, Mincy.

TEXAS:
Thomas Smith, Plato.
Hayden Lynch, Houston

LIST OF REPORTERS—Continued.

VERNON:
T. J. Davis, Nevada.
D. S. Mills, Moundville.
J. Q. Thomson, Walker.

WARREN:
James McIntyre, Pendleton.

WASHINGTON:
Dr. J. B. Bell, Potosi.
Dr. L. T. Hall, Potosi.
J. F. Bennett, Belgrade.
T. Sloan, Irondale.

WAYNE:
Anthony Zeitinger, Zeitonia.

WEBSTER:
J. M. Chadwick, Fordland.
J. F. Kendrick, Seymour.
B. B. Peck, Rogersville.

WORTH:
G. F. Bram, Denver.
C. M. Hunt, Irena.

WRIGHT:
W. H. Merchant, Astoria.
John Pope, Hartville.

MISSOURI STATE DAIRYMEN'S ASSOCIATION.

MEETING FOR ORGANIZATION.

EXPOSITION BUILDING,
KANSAS CITY, MO., Sept. 24, 1890.

During the summer of 1890, a circular was sent to the various creamery and dairymen throughout the State by the Secretary of the State Board of Agriculture, Hon. Levi Chubbuck, intimating the importance of the development of the dairy interest in this great State and suggesting the above stated time and place for as many as could make it convenient to meet him, for the purpose of discussing the advisability of some kind of a State organization. In answer to this call, a goodly number were present. B. O. Cowan, member of the State Board of Agriculture, was called to the chair, and C. W. Murtfeldt, of St. Louis, was made secretary.

Mr. Chubbuck then stated the object of the meeting to be as aforesaid. He proposed that the Board of Agriculture should hold a series of farmers' institutes throughout the State during the winter, and make dairying the leading subject of said meetings.

This thought met the approval of all, and several expressed a desire to have an institute held in their respective vicinities. By this time the meeting had assumed the character of an experience meeting.

A. Uhlman, of Irondale, Mo., wanted to learn how to run a creamery to best advantage on the Separator system. He represented a creamery operated by water power, and in this particular had great advantage, but they were not getting as much for their butter as he thought they should get; the creamery had lost money for some reason.

M. V. Lawson, of Bucklin, Mo., and J. W. Shivel, of Windsor, said they knew but little about the creamery business, although they were financially interested; they wanted to learn something that would give them a start.

Mr. Wm. Lewis, of St. Joseph, who has been in the business for several years, thinks it can be made to pay both the patron and creamery; but advised more winter dairying and not so much in summer while prices are low. He is confident there is more money to the western dairyman through the creamery than in any other way. He also believes in making full cream cheese or none. He is sure that oleomargarine is a great enemy to the western dairyman, and would not lament much to see it exterminated.

Mr. Sutton, of Nebraska, thinks the dairymen of Missouri ought to effect an organization to develop the dairy industry of the State. He thinks cows are neglected too much; is sure the care affects the quality as well as the quantity of milk.

H. N. Holderman, of Carthage, is in favor of disposing of the poor cows at once. He has had several years' experience in dairying, and wants an institute held at his place during the coming winter.

J. M. Smith, of Meadville, thought the failure of so many stock company creameries was due to inexperience; the patrons of such creameries do well enough, but the company pays too much for milk in the beginning. He believes in paying less and advancing the price as they can afford it. He also believes dairymen should make an effort to increase the production per cow, as well as do more winter dairying. He made a statement as to the earnings of cows under the gathered cream and separator systems and found 42 per cent in favor of the separator.

Levi Chubbuck then moved to organize a State dairy and creamerymen's association; carried. The following officers were elected:

W. M. Lewis, St. Joseph, President; C. A. Adams, Chillicothe, Vice-President; A. Uhlman, Irondale, Treasurer; J. M. Smith, Meadville, Secretary.

Committee on articles of association were:

J. L. Erwin, Fulton, J. M. Smith, Meadville, Levi Chubbuck, Columbia, to report at the next regular meeting.

W. M. Lewis, of St. Joseph, was appointed as delegate to the meeting of the Nebraska State Dairy Association, to be held at Pawnee City, Neb.

The following members were then enrolled:

G. W. Hicks, Kidder; D. Heney, Norborne; H. N. Holderman, Carthage; J. W. Shivel, Windsor; J. H. Hill, Edina; M. V. Lawson, Bucklin; Levi Chubbuck, Columbia.

The next meeting to be held at Jefferson City at the call of the President. The Secretary was instructed to make an effort to secure reduced railroad rates to next meeting.

Adjourned.

J. M. SMITH, Sec'y.

FIRST ANNUAL MEETING OF THE ASSOCIATION.

JEFFERSON CITY, MO., Jan. 15, 1891.

The Missouri State Dairymen's Association met in annual session at Jefferson City, Capitol building, 10 o'clock a. m., and was called to order by President W. M. Lewis. Minutes of last meeting were read and approved. Articles of association as drafted by committee appointed at last meeting were read, and after a few changes were adopted to read as follows:

ARTICLE 1. The name of this organization shall be the Missouri State Dairymen's Association.

ART. 2. The officers of this Association shall consist of a President, Vice-President, Treasurer and Secretary.

ART. 3. The Vice-President of this Association shall be the past President.

ART. 4. The officers shall constitute the Executive board of the association.

ART. 5. The officers of the Association shall be elected at each annual meeting and retain their office until their successors are chosen and qualified.

ART. 6. Any officer may be re-elected as often as the good of the Association demands.

ART. 7. The annual meeting of this Association shall be held at such time and place as the Executive board shall direct.

ART. 8. No two annual meetings shall be held in the same county within less than five years of each other.

ART. 9. Any male person may become a member of this Association by the annual payment of one dollar, and be entitled to all its benefits and privileges. Ladies will be admitted to membership free.

ART. 10. The Executive board shall have power to call speclal meetings whenever and at such places as in their judgment the interest of the association demands.

ART. 11. The Treasurer shall have custody of all moneys belonging to the association, and shall pay out same on order, signed by the President and Secretary.

ART. 12. The officers of this Association shall perform such other duties as usually devolve upon the officers of like associations.

ART. 13. These articles of association may be amended at any annual meeting by a vote of two-thirds of the members present—said amendment to be presented in writing to the Secretary, at least thirty days before such annual meeting, and be incorporated in the call for such annual meeting.

Mr. Jewett, of Crystal City, was introduced, and made a short statement as to the merits of his part of the State relative to all branches of agriculture.

A State law regarding the adulteration of dairy products was discussed.

A resolution was offered by O. C. Beach, of Appleton City, and accepted by the Association, to appoint a committee of three for the purpose of drafting a bill to offer to the Legislature, now in session, to suppress the adulteration of dairy products.

Committee, Levi Chubbuck, J. L. Erwin, O. C. Beach.

Ex-Governor Colman advocated the appointing of a dairy commissioner and establishment of a dairy school. W. J. Conover, of Bucklin, thinks it very important that a dairy school be established in the State.

A motion was made to appoint a committee of three to ascertain what steps are first needed to obtain an appropriation for the establishment of such a school.

Levi Chubbuck offers the following as a substitute for the above motion:

Resolved, That the Missouri State Dairymen's association, in annual session assembled, ask the Legislature, now in session, to provide such facilities in connection with the Agricultural college as will allow the establishment of a dairy school in connection therewith.

Resolution adopted by Association.

Mr. A. Leonard thinks our Agricultural college ought to be removed from the State University at Columbia.

Ex-Governor Colman thinks we will have no trouble in getting such legislation from the present Legislature as is needed to advance dairying.

The sentiment of the Association is that the Missouri Agricultural and Mechanical college be placed on a more distict basis than at present, to the end that the purpose for which it was established, namely—advancement of the agricultural interest of the State—be secured.

J. H. Monrad, of Chicago, was called upon and gave a very interesting and instructive talk regarding the World's Fair at Chicago, and the importance of the Missouri dairy interest being represented there.

A resolution was offered asking the Legislature now in session to appropriate not less than one hundred thousand dollars to secure a proper display of dairy and other agricultural products of Missouri at the Columbian Exposition.

The Secretary was ordered to prepare a report of the proceedings of the preliminary and first annual meeting, and as far as possible, a report of the extent of the dairy interest of Missouri, and furnish same to the Secretary of State Board of Agriculture for publication in the 23d annual report of the State Board.

He was also ordered to request the Secretary of the State Board to have one thousand copies printed separately, containing nothing but matters pertaining to dairying, for the use of the Association.

A resolution was adopted asking the Legislature to appropriate twelve thousand dollars annually for the use of the State Board of Agriculture, in advancing the Agricultural interest of Missouri.

The following officers were elected for the coming year:

J. L. Erwin, President	Fulton
W. M. Lewis, Vice-President	St. Joseph
A. Uhlman, Treasurer	Irondale
J. M. Smith, Secretary	Meadville

LIST OF MEMBERS.

J. L. Erwin, President	Fulton
W. M. Lewis, Vice-President	St. Joseph
A. Uhlman, Treasurer	Irondale
J. M. Smith, Secretary	Meadville
G. W. Hicks	Kidder
D. Heney	Norborne
H. N. Holderman	Carthage
J. W. Shivel	Windsor
J. H. Hill	Edina
M. V. Lawson	Bulklin
Levi Chubbuck	Columbia
D. H. Roe & Co., per Sawyer	Chicago, Ill
O. C. Beach	Appleton City
H. McK. Wilson, per Hanks	St. Louis
A. H. Barber, per Conover	Chicago, Ill
J. H. Monrad	Chicago, Ill
J. W. McNutt	Festus
J. M. Davis	New Haven
A. Leonard	Mt. Leonard
Norman J. Colman	St. Louis
Prof. F. E. Nipher	St. Louis
E. H. White	Tarkio
Mrs. H. W. Clarke	Jefferson City
Mrs. J. B. Gregg	Jefferson City
Miss Mattie Gregg	Jefferson City

At the close of the session, Mr. Sawyer, of Chicago, gave a very interesting talk regarding the testing of milk, and exhibited the Babcock testing machine, which attracted much attention and interest.

Thanks were voted to Mr. W. M. Lewis for his services as President.

Adjourned to meet as directed in article 7.

J. M. Smith, Secretary.   W. M. Lewis, President.

REPORTS FROM CREAMERIES.

Only sixteen creameries out of about ninety in the State reported for 1890, as follows:

Totals—Number cows	8,000
Pounds butter made	800,000
Paid to patrons	$120,000
Capital in creameries	$50,000
Men employed	100

So we see from the above, that the cows only averaged 100 pounds butter for the year, which is a very poor showing.

Respectfully submitted.

J. M. Smith, Secretary.

THE GREEN CITY CREAMERY.

[Statement presented by Chas. B. Comstock, manager, at the Sullivan County Farmers' Institute.

Having been requested to say a few words concerning the benefits of the creamery to the farmer, I thought I could do it in no better way than by giving a few figures which will show what has been done by the creamery at this place.

The creamery commenced work in the fall of 1882, the first cream being gathered on the 27th of September in that year. Since that date, until the present time, it has run continuously with the single exception of the months of February, March and April of the present year.

During many seasons it has been run at a loss to the owners; in fact, it has never made expenses during the winter months; yet, realizing that a share of its patrons had made their arrangements to sell during the entire year, it was run winter and summer regardless of profit or loss to its owners.

This has made a market for dairy products right at the door of the producer at all times, instead of going through the hard, laborious process of churning the cream and preparing the butter for market, and then taking it to the store, where it usually finds only a cool reception by the merchant. The cream gatherer comes regularly to the door, taking the cream and saving the housewife all further trouble. When pay-day comes, a bank check for the month's run is received, and no one feels under the least obligation to trade it out or to accept anything but current money of the realm.

There is also a much better market for what butter is made than there would be if there were no creamery here to absorb what would otherwise be an unmanageable surplus. During a good part of the summer months butter could hardly be sold at any price, if there were much more of it brought to town than the town custom would absorb.

Another person who has reason to hail the advent of the creamery with delight is the merchant, who would otherwise have to handle the butter which would come to market.

And Oh, what butter! Did you ever know of a woman that was not certain when she came to town that *her* butter was first class? Whatever failings her neighbor's might have, *her* product was all right. No odds if it were strong enough to bear all the dirt and refuse of an unclean pantry, although its odors might remind one of the Chicago river in August, and its colors be of as many hues as Joseph's coat; yet woe be unto that merchant who, in a moment of heedless desperation, might hint that it would not tickle the fancy of his most fastidious customer.

But a reasonable woman would often ask, and well she might, what is the use of trying to make good butter? As soon as the merchant gets it he dumps it in the same box with a lot of sour, rancid stuff that is fit for nobody's use; and however good I may make my product, however much pains I may take to have it sweet, well-flavored, and of just the shade to please the eye, yet I get no extra price for my extra pains.

But we promised a few figures regarding what has been done by the creamery here to better this condition of things.

During the last eight years it has bought 589,059 net gauges of cream, for which it has paid $69,163.75 to the women who raised the cream. It has paid $30,892.13 to the teamsters, butter-makers and other employes who were regularly employed in preparing the butter for market. It has paid $3,155 for tubs to put it in. The two items alone of price paid for cream and wages paid regular employes amount to $100,055.88. This does not include money paid for coal, ice, hogs, corn, and the thousand and one minor items of expense that are a source of continual outlay.

This is cash paid out to the farmers' wives and laborers who reside in or about Green City. This is $22,000 more than the entire assessed valuation of the village of Green City, both personal and real, together with the entire school district in which it is located.

We sometimes find persons who say the creamery is of no benefit, who endeavor to throw cold water upon all its undertakings, and who affect to say the country would be better off without it. To such persons we say, give these figures a candid consideration—they are official and may be relied upon as correct—and then think how many weary backs and days of toils and drudgery have, by its means, been saved to the wives and daughters of our fair community.

We quit the floor and leave the verdict with you.

THE TRENTON CREAMERY.

Statement presented at the Grundy County Farmers' Institute by Peter H. Yakey, Secretary and General Manager.

TRENTON, MO., October 16, 1890.

Statement of amount of milk received monthly, and amount of money paid out monthly for milk, at the Grundy County Butter and Cheese Company's factory from time of starting, August 5, 1889, to September 30, 1890.

Month.	Number.	Value.
August, 1889	115,112	$863 34
September, 1889	204,907	1,536 80
October, 1889	229,463	1,720 97
November, 1889	150,093	1,125 69
December, 1889	100,325	802 60
January, 1890 (½ time)	81,018	648 15
February, 1890 (½ time)	61,198	489 57
March, 1890 (½ time)	83,617	668 93
April, 1890	140,030	980 21
May, 1890	217,645	1,305 87
June, 1890	363,142	1,810 71
July, 1890	242,746	1,213 73
August, 1890	274,176	1,370 86
September, 1890	337,820	1,689 10
Total	....	$16,226 53

THE SALISBURY CREAMERY.

Statement presented by W. R. Slaughter, President, at the Chariton County Farmers' Institute.

The Salisbury Butter and Cheese plant was made by a stock company in 1889. They purchased ten acres of land for $1,000, and the contract for building and equipping and putting in running order and starting was given to Davis & Rankin, of Chicago, Ills., for the sum of $6,850, less $300 for location; Davis & Rankin taking $850 of the stock and guaranteeing a dividend the first year of 20% or forfeit their stock.

The first year we sunk about $2,800. On September 6, 1890, the Company owed the First National Bank, of Moberly, $4,000; the People's Bank, of Salisbury, over-draft, $86.12; the total debt to the two banks being $4,086.12.

We reorganized and have tried to turn over a new leaf, cutting expenses, in the way of labor, down about one-half. We have received since September 8, 1890, to date, October 20, 1890, $2,349.76, and paid out $1,607.67, leaving a balance to our credit of $742.09.

We are pretty well supplied with buckets, etc., and have a number of hogs, and we have a demand for all our products at this time at fair figures; hence we think we have a brighter prospect if the farmers will only increase the number of their cows and furnish more milk.

THE MISSOURI VALLEY
HOLSTEIN-FRIESIAN CATTLE BREEDERS' ASSOCIATION.

MEETING FOR ORGANIZATION.

MARSHALL, MO., May 28, 1891.

LEVI CHUBBUCK, *Secretary State Board of Agriculture:*

DEAR SIR—Complying with your request for an official report of the Holstein-Friesian Breeders' meeting, I enclose same.

Give us as good a send-off as you can in your next annual report. Hope you will be able to attend our meeting in October.

You will probably be able to put together the document I send. My time is very much occupied at present, or I should have written out all of it.

Very truly, etc.,

W. F. WHITNEY.

Motion carried, that we organize an association, same to be called "The Missouri Valley Holstein-Friesian Cattle Breeders' Association," and that all reputable breeders of said cattle, residing in the States bordering on the Missouri river, be admitted to membership upon complying with the by-laws of said Association.

On motion, Jno. Edwards, of Blackburn, W. E. Gould, of Marshall, C. H. White, of Orearville, and E. W. Corner, of Worcester, were appointed a committee to draft by-laws.

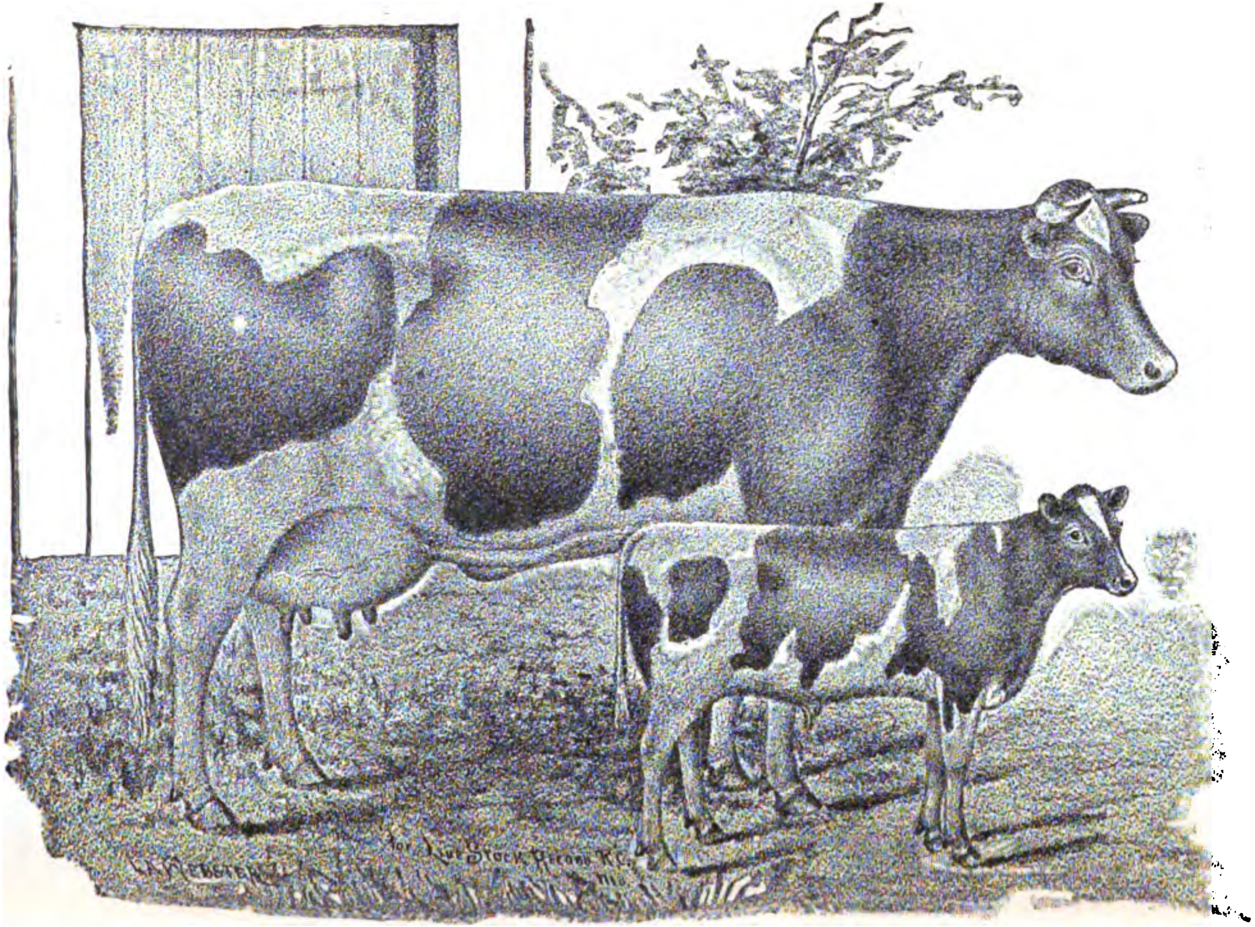
Motion carried, that we proceed to the election of officers to serve for the ensuing year, which shall consist of a President, Vice-President, Secretary and Treasurer.

The following officers were unanimously elected:

M. E. Moore, President	Cameron
J. B. Upton, Vice-President	Bolivar
W. F. Whitney, Secretary	Marshall
A. H. Shepard, Treasurer	Columbia

Motion carried that a board of five directors be elected at the first regular meeting of the Association, and that said meeting be held at Marshall, Missouri, on the 28th day of October, 1891.

Committee on by-laws submitted the following, which were adopted:


for Live Stock Record K.C. Mo.

"HORTENSE," FROM THE HERD OF M. E. MOORE, CAMERON, MO.

ARTICLE I.

SECTION 1. Any person of good character, who is a citizen of any State bordering on the Missouri river, and is interested in the breeding of Holstein-Friesian cattle, may apply for membership in this corporation, by filing a written or printed application with the Secretary, together with the initiation fee of one dollar.

SEC. 2. Every application for membership shall be submitted to the board of officers, and if, in their judgment, the applicant is eligible and worthy of membership in this corporation, and a unanimous vote of the officers present to that effect is passed, his name shall be entered on the records as a member.

SEC. 3. Any member may terminate his membership by notifying the Secretary, in writing, of his intention of so doing.

ARTICLE II.

SEC. 1. The board of officers shall consist of the several officers specified in article 3 of the constitution, who shall have management of the affairs of the corporation, and may meet at any time and place that may be designated by them, and a majority of its members present shall constitute a quorum for business.

SEC. 2. The President shall preside at all annual meetings, and at all meetings of the board of officers when he is present. In his absence, or when unable to serve, the Vice-President shall act as President *pro tem.*

SEC. 3. The Treasurer shall be the custodian of all cash funds and securities, and may be required to give bond with sureties as the board of officers may direct.

SEC. 4. The Secretary shall be corresponding and recording officer of the Association, and shall receive, attend to and dispose of, as by-laws require, all applications for membership in the Association.

SEC. 5. He is authorized to expend such sums as he may find necessary for the carrying on of the business of the Association.

SEC. 6. He shall issue notices of the time and place of the annual meeting, and of all special meetings which the board of officers may order to be called.

SEC. 7. He shall issue notices of meetings of the board of officers when requested to do so by the President or a majority of the board of direciors.

SEC. 8. He shall keep full and accurate records of all meetings when he is present, and in his absence a Secretary *pro tem.* shall be appointed to fill his place.

SEC. 9. He shall keep an accurate account of all moneys received and paid out by him in the performance of his duties, and report same at each annual meeting of the Association.

ARTICLE III.

SEC. 1. Notices of meetings of the Association and of the board of officers shall be mailed at least fourteen days before the meeting.

ARTICLE IV.

SEC. 1. The President, Vice-President, Secretary and Treasurer shall be elected at each annual meeting, to serve for the ensuing year.

SEC. 2. The board of directors elected at the first regular meeting shall serve for one year. At the second annual meeting two directors shall be elected to serve one year and three to serve two years. As these terms expire, same number of directors shall be elected to serve two years.

At the first annual meeting of the Holstein-Friesian Breeders' Association of Iowa, it was

Resolved, That we beg the State boards of agriculture within the jurisdiction of this Association, to recognize more fully the importance of dairy cattle in the said states.

Resolved, That we condemn the manufacture and sale of all imitation butter and cheese, and ask the aid of all dairymen throughout said states in suppressing the same.

Resolved, That the Secretary notify all who may be interested in the breeding of Holstein-Friesian cattle in said States of the organization of this Association, and invite them to make application to become members of the same.

Resolved, That we return our sincere thanks to Colman's Rural World, Kansas City Live-Stock Indicator and Holstein-Friesian Register, for their kindness in publishing the call for this, our first meeting.

On motion, the meeting adjourned to meet as above.

J. H. FERGUSON, Chairman.

W. F. WHITNEY, Secretary.

DAIRYING.

ESPECIALLY CHEESE-MAKING, THE PROMISING INDUSTRY OF THE UPLANDS OF MISSOURI.

[Paper by WILLIAM MUIR, read at the Farmers' Institute, held at Clayton, Mo.]

The topic selected for our present consideration, the uplands of our State, is proverbially a hard and dry one, one that is generally regarded as a fit subject for ridicule and pity by the citizens of other supposedly more highly favored states. I do not come as the apologist for the uplands of our State, but as a sincere lover and admirer of them, perhaps so to enthusiasm. Still there is a singular fact that has a tendency to create wrong impressions in the hurried traveler, and all travelers are in a hurry, generally much more inclined to run over great distances than to learn the facts associated with what they see. The fact that we refer to is, that travelers from the east and south pass over magnificent prairies or richest bottoms, before they reach the city of immense proportions, view with surprise the grandeur of the great "Father of waters," and almost whenever they step into the railway cars are confronted with the eastern spurs of the Ozark mountains, and rush through, the ravines and canons without being able to see their beauties or realize their utilities, and before they reach the truly fertile center of the State they are jaded, brain-sore and misanthropic; and how many find that "they go farther only to fare worse"?

For years the people of this extensive country have been taught that the El Dorado, the "promised land" of North America, is west—west! west! till it seems as if the people are smitten by a strange blindness, so that they can see neither beauty nor utility, except in vast fields, extensive prairies, rich savannas; miles of wheat and corn fill the minds, and after them they have gone with a rush, till the broad fields have been increased so far beyond the ratio of natural increase of population, the advent of the European cousin or the demands of trade, that the corn has to be used as fuel and the wheat is eaten up by insects, or transportation charges, or a competition maintained till real trade has ceased and gambling in breadstuffs has blighted our fair land, and the soul of industry has been sucked out by the vampires of speculation.

We see a plethora of the great food crops in the west, and deserted farms and abandoned homesteads in the east, along with the almost utter neglect of those minor crops and products that give zest and variety to life, furnish the changes of diet and culture that are essential to fertility in the soil, health to the individual, and wealth and commercial independence to the nation.

Another and most important aspect of the case presents itself in the close inter-relationship that exists between the individual, the natural surroundings and the occupations. There can be no doubt that he impress made by nature on a district of country is re-impressed upon its people, and this is made especially distinct and powerful when it has acquired the permanence produced by heredity, through several generations living under the same conditions. The world over, we find that the mountaineer, the uplander if you please, carries well-defined traits of character. The rugged hills, deep valleys, heavy timber growth, thin soil, small areas suited to tillage, isolated farms, create clear, independent thought and action, close observation of Nature's processes, prompt analysis of conditions and capabilities, economy in the expenditure of force, and frugality in the use of its results, the direct and intimate contact with nature, and the constant feeling of accountability to her only nurtures genuine love of home, makes the true patriot, fully, practically imbued with the ideas of "equal rights to all, special favors to none." Thus, in the mountains of Switzerland, of Greece, of Hindustan, of the world over, we find the "mountain" the cradle of the intelligence, the liberty, and the independence of the world.

As in the southern climes so highly favored by Nature's spontaneous growths, there is but little left to call out either mental or physical energy, listless inactivity of both body and mind rules, so in the ice-sealed dwellings of the Arctic lands the very paucity of natural products, the limited range for action in its short summer and its severe winter, the necessary seclusion and inaction dwarfs the mind as well as the body, and perpetuates races devoid of ambition, and without any stimulus to progression. So the variedness of our climate, the rapidity and range of its changes, gives variety to our productions, enhances the color, flavor and quality of our fruits, gives health and vigor to our grasses and grains, keeps malaria and noxious insects in check, produces health, vigor and variety in our domestic animals and their products, presents the highest range of mental development, the greatest energy, the purest ambition, noble citizens, and above all, the best of women. Here, in the uplands of Grand Old Missouri, in spite of its zealous detractors, we have the epitome, the quintessence of all that is best in the temperate zone.

Ladies, if you could take a bird's-eye view of these uplands, these hills and vales, the ever-varying scenes of natural beauty, these glistening streams and gorgeous rivers, these quiet homes and orchards, these gem-like fields and emerald pastures, these zig-zag fences and woods fringes, the ever-varying form, color and odor of foliage and flower, these pure natural treasures of health and pleasure, well, you would pronounce them the veritable "crazy-quilt of creation," and feel proud of it as such.

But then there are some few drawbacks. We realize the truth of what the poet says:

> "'Poor race of men,' said the pitying spirit,
> 'Dearly ye pay for your primeval fall;
> Some flowerets of Eden ye still inherit,
> But the trail of the serpent is over them all.'"

The migrations, the changes of location of our people have been wonderful, and pregnant with wonderful results, many of them grand, some of them questionable. The changes have been as a rule on parallel lines, west. In their changes of habitat they have carried their habits and cultural preferences, in many instances in the face of opposing natural cultural conditions; hence the constant struggle on these limited areas and thin rolling lands to produce crops of wheat and corn, and the disappointment that the same mechanical aids to culture, the same labor-saving machines cannot obtain on the uplands that are possible on the prairies and savannas.

Then we have grief and disappointment when we see all that is valuable to crops in our soils, when under constant tillage, disintegrated by our frosts and suns, and carried away by our rains and winds to the valleys and bottoms or the ocean deltas, and nothing left but sun-hardened clays or barren rocks. Here lies the fatal mistake of the cultural methods of our uplands.

We propose to remedy this by keeping our hills in grass; by making milking stock and sheep replace the plow and the cultivator to as great an extent as possible. By well-directed efforts in this direction we can measurably control the action of the elements in impoverishing our uplands, and we can cause the waste products of our herds and flocks to be made a source of increasing beauty and fertility with but little direct effort by us.

Besides, we can secure a compact, portable form for the products of our uplands in the production of milk, butter, cheese and wool, and take an important step in solving the problem of the cheaper transportation of the products of the farm.

We do not intend going into any details of dairying; that is in abler hands; but we call attention to one important feature of this great subject, viz.:

MEDICATED MILK AND KOUMISS.

From boyhood we have been familiar with the use of fresh milk as a recuperative agent. In connection with the pure air, elevation above the ordinary sources of malaria, the varied forms of equestrian, pedestrian, and other open-air exercise for which our hills are so finely adapted, the fresh milk of the cow, sheep, goat and ass can be so adapted by feed and handling as to form the grandest of nutrients and "easily taken" medicaments for the invalid or infant, or the weakened, declining vitality of old age.

We believe that the day is not far distant when health, recreation and enjoyment will be sought out in our upland homes instead of being busily sought for at a fabulous cost in the tumult and excitement of seaside resorts, the distress, aye, wretchedness of the ocean voyage, or the dissipation and danger of European travel. Even the votaries of fashion will be able to find them in our own grand State, on the uplands of the noble central ridges, on the bluffs of our beautiful rivers, when the glamour of foreign lands and foreign products shall be broken, when our people shall delightedly behold American beauties with American eyes and cherish them in American hearts.

In passing from this portion of our subject, we may remark that we have given attention to this subject of medicated milk for several years, and find that the natural growths of our woodlands, worked over by the sheep or goat or the ass, are highly esteemed by many medical practitioners, and that koumiss, so much held up as a curative and nutrient in cancerous conditions of the stomach, can be produced in perfection on our uplands, and can readily be used there, or supplied in its purity to the patients and hospitals of our cities.

To make clear the relations of the several milks, we give the following official table:

	Cow....	Ass....	Goat ..	Mare....	Human..
Water	87.4	90.5	82.0	89.6	88.6
Oil or butter	4.0	1.4	4.5	trace	2.6
Lactine and soluble salts	5.0	6.4	4,2	8.7	4.9
Caseine, albumen and fixed salts	3 6	1.7	9.0	1.7	3 9
	100	100	100	100	100

We come now to notice an important matter in connection with the butter-making department of dairying, one that is forced upon our attention with grievous power in our section, and all the country immediately contiguous to St. Louis, and we regret to say is not confined to this region alone. In examining the market reports for butter, in the months of June, July and August, particularly, you will find the several grades of butter quoted at from 20 cents to 35 cents per pound; then follows, near by, 6 to 19 cents. We have tried to get the true inwardness of this discrimination against what should be, other things being equal, the best butter that goes to St. Louis' market. A very exhaustive examination of the subject and actual tests showed these facts. We saw and tasted some of the best butter every made, the product of a fine dairy, fine cows, handled by a careful, experienced lady. It was sold to a local merchant, carried to St. Louis in an ordinary spring wagon, without ice. When opened in St. Louis was soft, thoroughly shaken up, permeated by the air, was truly the "near-by" article, sold at 10 cents. Had it been put up in ice, or in a refrigerator as the large dairies or creameries do, it would have sold, as some of the same, but differently sent did, at 30 cents.

Here, again, the poor man, the small producer, is the victim of conditions he cannot well control. In the thinly settled portions of the country, on the small farm, a system of co-operation calculated to secure the best conditions and most profitable results cannot well be carried out. The cost of ice, the difficulty of obtaining it at all, the cost of refrigerators and the want of proper means of sending it directly to market in good condition, makes the products of the best dairying months of the year valueless. We were familiar with similar conditions fifty years ago, and the remedy, a perfect one, was found in

CHEESE-MAKING.

We urge this subject on the attention of this meeting with all the earnestness of profound conviction.

We do not intend to go into the details of cheese making just now, but simply to urge its importance. The cheese can be made from the whole milk, or skim milk, and is certainly one of the best and most economical articles that can be placed on the farmer's own table at any season of the year. It is healthy and substantial, and if only to give value to the milk during the summer months and give permanence to a rapidly-decaying product, thus stopping a great leak on the farm, every one should try it.

Here, again, we appeal for the co-operation of the ladies. They can come to the rescue, help us to develop this great industry by making its use fashionable; by making cheese an article of diet in some form on every table. Try the skeptical with "cheese omelet," "macaroni pudding," "cheese toast," "cheese and bacon," and a score of other combinations, and we will have a national rush for this article. Ladies, you can help us. If we had cheese omelet here just now the conversions would be numerous in this audience, and the smack of satisfaction would be like quivering lightning, and it would soon have a welcome place on every table.

We will now examine our position as a cheese-consuming people. In 1880 we produced 22,272,489 pounds of cheese to a population of 50,155,783, or about one-half pound cheese per head per annum. Certainly nothing to hurt any one. The average price of cheese in New York from 1880 to 1889 was 12 1-3 cents per pound. If only one-half pound per week, or about one ounce per day to each of the population, it would amount to 1,664,000,000 pounds, and at 10 cents a pound would amount to over $160,000,000.

During the year of 1889 we imported $1,295,506 worth, a snug little sum we can easily save from an almost waste product.

The farmers in New York State are taking measures to get the legislature of that State to cause cheese to form a part of the rations of the penal and eleemosynary institutions of the State; this is good, but we want it placed upon the higher plane of health, economy, utility, desirability, and commend it as an article of diet to our people at large and do not deny it to the others more unfortunate.

There is another point of some importance: viz., the fact that cheese cannot be brought into competition with a fictitious or adulterated product, as is the case with butter in its competition with oleomargarine or bogus butter.

The increased value of skim milk in butter dairying is a subject worthy of some consideration, and the use of the milk of the sheep and the goat to give piquancy to the flavor will give an increased value to these animals.

I have but outlined a few of the phases of this most important subject, and hope it will lead to an inquiry after details.

Ladies and gentlemen, I sincerely thank you for the patience with which you have listened to a truly dry subject, treated in a dry manner, but our aim is to make these dry hills flow with milk, perhaps with money later; we know we can make them produce the best of butter and cheese. I may be deemed an enthusiast, but it is in a noble, unselfish cause. My apology for thus trespassing on your time and attention is best set forth in our sublime National anthem, "My country, 'tis of thee," for

"I love thy rocks and rills,
Thy woods and templed hills,
My soul with rapture fills
Like those above."

THE SILO AND ENSILAGE.

[A paper by Thos. Midldlemas, read at the Farmers' Institute, held at Willard, Mo]

The increase of scientific knowledge and the wonderful progress of mechanical invention in our day, has revolutionized the methods pursued in almost every branch of industry. In many of the manufacturing arts, in the means of travel and transportation, the labor of one man is now, perhaps, equal to the labor of ten men fifty years ago.

Farming has not made equal progress, yet, when we look back upon the methods of our grandfathers, we can discern that great improvements have been made.

I am fully convinced that the discovery of a cheap and simple method of preserving a crop of corn, clover, or any other suitable crop, in a green and succulent condition, that can be fed to cattle, horses and sheep, during winter, without deterioration, and without waste, is one of the most important discoveries made in our time, and will, at no distant day, interchange the present methods of farming, especially in the United States, as this is the great corn-growing country of the world.

The silo is not an American discovery, but I believe that the Americans have done more to simplify and cheapen the methods of building silos and preserving ensilage, than the people of any other nation. The evolution of the silo has been rapid. It is only about fifteen years since the first silo was built in the United States. The first experiments were only partially successful. The few scientific principles that were bound to be observed before success was possible were not then understood, and could only be found out by repeated experiments, many of them bound to be more or less failures. I have closely studied the ensilage question, from reading alone, however, for several years past, and some time ago I was convinced that the leading farmers of Wisconsin, Ohio, New York, and of many other States, had solved the problem, and, in fact, had brought the whole business to the point of perfection. The building of silos has hitherto been far more practiced in the dairy districts than elsewhere, but in time that will change; wherever corn can be grown silos will be built.

I built a silo last summer, and I will relate my experience. The size of our silo, inside measurement, is 43 feet in length, 24 feet in width and 20 feet high. If well filled with properly matured corn ensilage, reckoning a cubic foot to weigh forty pounds, the capacity of our silo is 412 tons. I built the silo on level ground, but with a fall from it on two sides to insure perfect drainage. The frame is oak, the sills are 6x10, the top plates 4x10, the studs 2x10, the four corner posts 10x10, and the rafters 2x6. The studs are sixteen inches apart.

I followed the methods of the most experienced siloists in every particular but one. I believe that I discovered an improved plan for the foundation of a silo. It is usual to dig a trench in the ground and place the sills in it, having the top of the sills on a level with the surface of the ground; that is done in order to exclude the air. Instead of that we dug a deep and wide trench and placed mulberry blocks on end, sixteen inches apart, and laid the sills upon the blocks, one foot above the level of the ground, and spiked them to the blocks with harrow teeth. We then hewed the blocks down flush with the sills to a depth a least one foot below the level of the ground. When the frame was up there was an even, straight continuous wall, inside and out, from the bottom of the trench to the top of the rafter plates. We then covered the walls inside and out with rough oak lumber, very securely nailed, and at the corners the boards were interlocked on the inside to the 10x10 corner posts, which is a necessary precaution to prevent the building from spreading. On the outside corners we nailed the first covering of boards, at an angle of 450, to brace the building. Upon this rough covering, or sheathing, we tacked tarred building paper, both on the inside and outside, overlapping the edges about two inches. We then nailed pine boards eight inches wide, dressed shiplap fashion, upon the paper, the nails reaching through into the studs. The inside and outside of the walls are exactly the same, a double course of boards with tarred paper between. We then painted the walls on both sides with Mr. John Gould's mixture of coal-tar and gasoline, one part of gasoline to two of tar. It makes an admirable paint for the purpose; it is cheap, very easily laid on, leaves a hard, glossy surface, and makes boards quite impervious to water. A building painted with black paint on the outside don't look well, but a silo is not built for ornament. We placed ties across the top of the walls, bolted to the rafter plates, to prevent the spreading of the walls. The roof is an ordinary shingled roof without paint or paper. The trench in which the foundation blocks were set was filled in after the bottom boards were thoroughly painted with coal-tar; the earth was then well rammed down in order to exclude the air. The advantage of placing the sills on blocks is, that when the boards below the ground rot, they can be easily replaced, but when the sills of a building rot, it is a difficult job to replace them. A stone wall does not answer for a foundation, as it is impossible to join the wood to the stone so as to make it air-tight. On one side of the roof there is a door made like a dormer window, through which passes the elevator from the cutter. On one end of the silo we have three doors, all in a line from the gable to the ground, but with a space between each in order to tie the building together with the through boarding.

Our silo is simply a large air-tight box with the earth for a floor. Rods or beams through this box would obstruct the settling of the ensilage, let in the air and spoil the whole business. For this reason the walls of a silo must be built strong and stiff, as such a large surface of unsupported wall cannot resist much pressure. Strong as our silo was built, the settling of the ensilage bulged the walls out about three inches in the center. One would think that the lateral pressure could not be very great, yet it is the experience of every one that a silo will bulge unless made strong. The down pressure; must, of course, hold fast the gain made by the lateral pressure, therefore, the lateral pressure, though small, must be constant during all the time the ensilage is heating and settling. How corn stalks-cut in small pieces and filled into a silo could exert so much side pressure was to me a great puzzle for a long time, and I am not sure that I quite understand it yet. However, it is a certain fact that a silo must be built stiff and strong, otherwise it will bulge and crack open, let in the air and spoil the whole thing. The doors at the end through which the feed is taken out, must be carefully boarded up on the inside and covered with tarred building paper, as the filling of the silo proceeds. In feeding out the ensilage; we began at the top door and made a narrow cut down to the floor; we then fed from the face of the cut, taking off a small portion of the face every day. By that means no portion is left long enough exposed to the air to spoil. The ensilage is packed so solid that it stands in a perpendicular compact face.

We planted twenty-eight acres of corn for ensilage. The land had been in clover and grass for several years and was rich. It was plowed in the fall and well harrowed in the spring. We planted in rows three feet six inches apart, and eight inches between each plant. We cultivated the corn shallow, but the land was kept very clean and mellow. On sod land plowed in the fall, deep cultivation is not required; cutting the roots of corn is an injury, and should be avoided if possible.

We planted what is called B. & W. ensilage corn, or the Virginian Mammoth Southern sweet. But whatever it may be called, it is, in this latitude, by far the best variety known for making good ensilage, it grows large, has a great amount of leaf, fine ears and a large number of them. But perhaps the most valuable quality this variety of corn possesses for ensilage is, that the stalk and leaves keep green and fresh till the ears are matured. Ours did so, at least, after the ordinary corn was dry and withered.

We bought a No. 14 Smalley ensilage cutter with carriers; it is a perfect machine for the purpose; other machines may be as good, but cannot be any better. We began cutting and filling on the 10th of September; we could have finished the twenty-eight acres in eight or nine days, but it rained nearly every day for a month. Last September was the wettest month ever known in this locality. We almost despaired of success, but we worked every hour of fair weather, and when it began to rain we stopped, as it ruins ensilage to put it into a silo wet with dew or rain. We had between eleven or twelve tons of corn to the acre, but if it had not been for the severe drouth in July, there would, no doubt, have been fifteen tons or more. The twenty-eight acres only filled the silo three-quarters full or fifteen feet deep, which estimated at forty pounds to the cubic foot would be 312 tons of ensilage. If the silo had been filled quite full the pressure would have been much greater, and would have averaged perhaps forty-five pounds to the cubic foot; at that rate the silo would contain 464 tons.

I never saw a silo or ensilage before, yet we made as good ensilage as ever was made in the United States. Here is a sample of it, you can judge for yourselves. We labored under the disadvantage of having no first-hand knowledge, and of having extremely wet weather during filling, yet we succeeded.

The truth is, the whole business is very simple after you know how. A few scientific principles must be understood and observed;

at least they must be observed, whether understood or not, otherwise success is impossible. In the first place, the silo must be water-tight, frost-proof, and as nearly air-tight on the sides and bottom as we can get it. The dead air space between the studs secures an even temperature; dead air is the best non-conductor of heat known, and if the building is carefully constructed, the double lining of tarred paper between the boards makes the walls practically air-tight, and the bare, hard earth is almost as good a floor as can be made, and besides it has the great advantage of costing nothing. The next important point is, that the corn must be well matured, almost at the stage suitable for cutting for shock fodder. The feeding value of corn is not nearly so great when cut very green; and another objection is, that it ferments too much and becomes sour. In fact, this was the main mistake made by the early experimenters; they cut the corn far too green and made a kind of sour krout, which was an unnecessary and fatal mistake.

We cut up the whole plant, stalks, leaves, ears and all, into half-inch lengths. The cutting and filling must be done when the corn is free from damp either from dew or rain, otherwise the ensilage will mould. The filling of the silo can be carried on every day, and should be spread evenly as it falls from the carriers, and well tramped, especially along the sides and corners; there is great danger of overheating if the ensilage is left loose for several days. The size of a silo does not greatly matter, but I believe the larger the better. I am quite sure, however, that a high silo is far preferable to a low one. The higher the ensilage is piled the more pressure and the more compact it becomes; more air is driven out when the ensilage is packed solid and less chance for the air to re-enter, consequently less danger from over-fermentation and overheating. Build a high silo every time; twenty feet is little enough, twenty-five feet would be still better.

Ensilage begins to ferment and heat in a very short time; a large, loose pile will heat to 120 degrees in twelve hours, and if left loose will rise much higher. It is not safe to allow ensilage to heat beyond 130 degrees, and the way to prevent it is to keep on filling and get more pressure to drive out the air. From 120 to 130 is the proper temperature. The heat rises much higher at the top of a silo than toward the bottom, and just how to manage the top to get the very best results, without too much labor, is a point I am not clear about. We simply leveled it off, tramped well, then covered with paper. On the top of the paper we put five or six inches of cut straw and chaff; about three inches under the paper was moulded, all below that is as sound as ever was made. Sufficient pressure would infallibly save every particle; a covering of boards weighted with rocks would do it, but whether it would pay or not I cannot say.

A large mass of ensilage in a good silo parts with its heat very slowly. I tested ours the other day, and found it 95 degrees in the warmest place. The heat destroys the germs of mould, and other germs now known to cause decay. The heat partially cooks the corn, and when taken out and fed to cattle, it is much more digestible and palatable than before it was put into the silo; our cattle eat it with greedy relish, leaving none of it; they will not touch the finest hay as long as they have any ensilage left.

Now we all know that there are a great many fine things in this world, but some of them cost too much, more than they are worth, and are therefore useless in any business, especially so in farming. The test of the question is, does it pay?

I have already stated that our silo, if completely filled, would hold 464 tons or thereabout. The building cost about $500, the cutter and carriers $100 more, making the total outfit about $600, or $1.30 per ton capacity. To run the cutter to its full capacity it requires two men in the field cutting corn and laying it in bundles; four men and four teams, loading and hauling; two men feeding to cutter and attending to engine, turn about; two men in silo spreading and tramping; that is ten men and four teams, with rent of engine, we will say $15 per day the cost of running. The above is a correct estimate of cost if the corn is not very far from silo, and if the weather is fine from forty to fifty tons per day can be put away; we will call it forty tons, which comes to 37½ cents per ton for cutting and filling. The cost of raising a crop of corn is the same as when it is harvested in the usual way, so that I may pass that part of it altogether.

Now the question is what is, the value of ensilage as food for cattle? Chemists tell us that if the corn-plant is cut when properly matured, there is as much nutriment in the stalks and leaves as in the grain itself. If that be so, and I have no doubt of it, the silo doubles the return from the crop. But that is not all. We know that not much more than half of the corn as usually fed is digested and assimilated by cattle. If that be so, only one-quarter of the corn crop goes to nourish the cattle fed upon it. Now if ensilage is properly fed to cattle, it is almost all digested: there is hardly any waste at all. In that case the feeding value of the crop is increased four-fold. I am confident that the value is increased three times at least; my own experience bears out that conclusion.

We have 94 cows, 18 head of yearlings and 2 bulls, 114 in all. We began to feed ensilage on the 15th of November; we fed on an average nearly two tons a day, with a very small feed of hay in the morning. The fresh cows get one pound of ground linseed cake and one pound of bran, besides 35 pounds of ensilage and the little bit of hay. This is not full ration. In this county the hay crop was last season the poorest known for years. We have not half enough of hay; bran is a very high price, and we can only do the best under the circumstances. Our five mules and two horses eat more than all the cattle get. The cattle, both cows and young stock, are doing better than ever before, and at the rate we are feeding the ensilage, the 28 acres will last until the middle of April.

In order to get the very best results from corn ensilage, milk cows should be fed two pounds linseed meal, four pounds bran, eight pounds of clover hay and thirty or thirty-five pounds ensilage. That makes a balanced ration, and is enough for an ordinary cow a day; it should be given in three feeds, morning, noon and night.

Corn produces more food per acre than any plant grown, and is the grandest crop the farmer raises; but it is folly to feed it to cattle or any other stock without a mixture of something else. Corn is far too rich in the fat-forming elements, and poor in the elements that go to make flesh and bone. The only way to correct that defect of corn is to feed it along with other food stuffs that are of an opposite character, such as cotton-seed cake, or meal, wheat bran and clover hay; young growing animals are permanently injured if fed for any length of time on corn alone. A very small addition of any or all of the things I have mentioned will make a perfect mixture with corn ensilage.

The exact feeding standard is, I understand, a nutritive ratio of one to five: that is, one pound of flesh-forming elements to five of fat-forming elements; therefore, the defects of corn or corn ensilage, are very easily corrected.

Some of the best dairy farmers in Wisconsin have now ceased pasturing their cows in summer; they feed from the silo all the year round. They silo corn, clover, millet, oats and peas. They claim it is cheaper than pasturing, as one acre will produce as much as three, and that on high-priced land it pays to expend the extra labor.

We need not trouble ourselves here yet about the summer feeding of stock; it is the winter that pinches us. I may be over sanguine, yet I feel confident that in another year we will be able to keep our stock during the winter six months as cheaply as during the summer six months; that is to say, if the land is valued at $40 or $45 per acre. If it can be done in Wisconsin, or New York, it can certainly be done here in Missouri. There, to be safe from early fall frosts, they can only grow a small, early variety of corn; here we can grow the Mammoth Southern Sweet, and have it safe in the silo long before the first frost. We have at least two months more growing weather than they have in the extreme north.

In conclusion, I may say that no one need be deterred from building a silo on account of the difficulty of doing the work right.

It is a much more simple thing to make good ensilage than to make good hay. In fact, it is ten times more difficult to make good hay in showery weather than to make good ensilage.

ENSILAGE IN DAIRY FARMING.

[Bulletin No 14, of the N. H. Agricultural Experiment Station]

The following bulletin is put out at this time, not because of the original investigation which it records, but more as an aid to those farmers who may be thinking of adopting the silo as a means of increasing the profits of dairy farming, by decreasing the labor item in the production and storing of the required food.

The present outlook for an abundant hay crop, while not positively discouraging, is not especially flattering, and I have no hesitation, after five years of practical experience with ensilage, in saying that no dairy farmer in the State can afford to be without a silo. Even on the so-called "natural grass farms" a moderate use of ensilage will prove beneficial. Now, if this is true, and I am sure that time will fully demonstrate that it is, then the more rapidly farmers adopt the system the better; and I am led to issue this bulletin for the purpose of calling the attention of as many as possible to the matter, at a time when it is possible to take immediate steps toward guarding against a shortage in the hay crop.

There is now time to extend the acreage of corn for the silo; even as far north as Hanover we have produced good crops of fair quality when planted as late as June 10th, and certainly throughout the greater part of the State, from the 1st to the 10th of June would not be too late for ordinary seasons.

ADVANTAGES OF ENSILAGE.

1. More actual food material can be produced from an acre of corn than from any other of our common farm crops. Land capable of producing two tons of hay will, as a rule, produce twenty tons of ensilage, having at least twenty-five per cent of dry substance, or actual food material; 40,000 pounds of ensilage equals 10,000 pounds dry matter; 4,000 pounds of hay equals 3,000 pounds dry matter.

It is safe to say, therefore, that three times as much dry substance may be produced from a given area of corn as from a like area of grass.

2. The cost of 100 pounds of dry matter is slightly less in corn than in hay.

In our experience we have found the following figures to be substantially true: 100 pounds dry matter in ensilage cost 42 cents; 100 pounds dry matter in hay cost 44½ cents.

3. Green food is especially favorable to the production of milk. The succulent pasture grass in May and June is without an equal as a milk-producing food. Mangels and other roots, when fed in combination with dry fodders, are known to have a very beneficial effect, and with ensilage the same has been observed.

In an experiment carried on at this station, where hay and ensilage were compared, the following averages were obtained: Ensilage ration, containing 16.45 pounds digestible dry matter, produced 21 pounds milk. Hay ration, containing 16.83 pounds digestible dry matter, produce 18.4 milk.

There are those who claim that a pound of digestible matter in one substance is as good as a pound in any and all other substances, and that succulence adds nothing to the value of a food. This I do not regard as proven by practice. In Bulletin No. 11, of this Station, it was shown that 100 pounds of digestible matter in a ration made up of skim-milk and corn meal was equal to 146.6 pounds of digestible matter in a ration chemically identical, but made up of corn meal and middlings. Practically, there can be no doubt that a pound of food material in the skim-milk ration was superior to a pound in the mixed grain ration, and I believe this was due largely to the favorable condition in which the digestive and assimilative organs were kept by the former ration. This being true of skim-milk, I see no reason why pasture grass, roots or ensilage may not be likewise more valuable than dried fodders. In fact, I am convinced that foods containing a large per cent of water keep the animal system in such tone that it is able to make better use of the food digested. The efficiency of the steam boiler is very largely affected by the deposit of soot on its flues—not that the boiler or its flues are changed, or that the combustion of the coal is less perfect, but rather that the heat produced by this combustion is not utilized in steam-making. So, although the same amount of food may be digested in one ration as in another, yet the physiological condition of the animal may be such that this digested matter may in one case be utilized to far better advantage than in another. The problem, then, is not one of efficiency of food so much as of efficiency of the machine: *i. e.,* the animal; and it is this animal efficiency which succulent or watery foods increase. The fact exists, that in every-day practice 250 pounds of average ensilage will fully take the place of 100 pounds of hay, and in most cases the milk yield will increase on this rate of substitution.

The 250 pounds of ensilage will contain 41 pounds digestible matter, while 100 pounds of hay will contain 51 pounds digestible matter, or 100 pounds of digestible matter in ensilage is fully equal to 125 pounds in mixed hay; and as the proportion of albuminoids to non-albuminoids is not essentially different, this gain must be due to the condition of the two foods.

4. Convenience and cheapness of storing: A corn crop having been produced, it must in some way be preserved for winter feeding. "Topping the stalks," binding and stooking them, leaving the ears and butt stalks to dry out, was at one time the prevalent method, but it involved too much hard labor. Stooking the entire crop as soon as the ears are well glazed, and allowing them to dry for a month or more, husking the ears and mowing away the stalks, reduces the labor, but still there is the cost of husking, grinding the grain, etc., which, at the present period of low prices for milk and dairy products, bears too heavily on the raw material item in the problem. To "reduce the cost of production" is the great problem in agricultural progress, and it must be done by reducing the amount of human labor which enters into farm products. A system of stooking corn in large stooks, and leaving them in the field until wanted for feeding purposes, has been and is practiced to some extent; it saves labor but wastes the crop, and is inconvenient in many ways. Curing the crop and storing is practically impossible on a large scale, since the amount of water to be dried out is very great, and the weather frequently unfavorable; in a small way it can be practiced, but the disadvantages more than offset the advantages. The silo, while not an ideal storage vault, does combine more good points and less bad ones than any method yet devised for preserving the corn crop, for the following reasons:

(a) The farmer who has a silo is about as independent of the weather as any man can be. Heavy rain, it is true, will prevent the storage of ensilage, but, aside from, rain, nothing interrupts this kind of harvesting; light rain and showers, while making the work disagreeable, do not put a stop to it necessarily, and when once in the silo, all danger of imperfect curing, which so often injures the crop harvested in the old way, is past.

(b) The season is practically lengthened from two to three weeks, since it is not desirable to have the corn for the silo much past the "boiling" or "roasting" stage; hence, a variety may be planted for this purpose, which stands no show for ripening, even one year in ten, and as the later varieties of corn are of larger growth and produce

more actual food per acre, this gain is by no means unimportant in the more northern parts of New Hampshire. Again, if from unfavorable weather in May, planting is delayed, as already stated, until the first days of June, there is very little risk connected with the crop for the silo, where a crop for husking would be almost certain to be cut off by the fall frosts.

(d) The early date at which the land is cleared makes it possible to either seed down to grass or winter grain. Corn for the silo should be stored at about the same time at which corn for the husking should be stooked, and as the stooked corn must dry out for about a month before husking can begin, it follows, that practically the whole of this time is gained for working the land for the next crop.

(e) The cost of harvesting, provided the crop is planted within reasonable distance of the silo, is reduced to a low point. It is true a large bulk of water has to be handled, and very much depends upon the conveniences for handling; an attempt was made to determine the lowest cost at which ensilage might be handled per acre and per ton, with steam power for cutting and elevating into silo, and with an abundance of help, on a two-acre field, the average distance of which was seventy rods from the silo, with the following results:

Cutting the corn in field, per acre	$2 00
Loading and drawing to barn	3 75
Cutting and packing in silo	2 40
Use of engine and cutter	1 25
Yield per acre, 15 tons. Total cost	$9 40
Cost per ton	62⅔

The crew consisted of three men cutting, three helping load, three teams, and four men to run the work at the silo. With this crew 24½ tons were put in the pit in 4½ hours.

In 1884, under more favorable circumstances as to distance and location, a seven-acre field of corn was harvested with the greatest economy possible, and with the following results per acre:

Cutting and stooking	$2 16
Drawing in fodder and cribbing corn	2 56
Husking	5 00
Drawing corn to mill	1 50
Grinding	1 80
Total	13 02

While I do not have the exact figures as to the per cent of dry matter in each crop, yet there was not above 6,000 pounds in the husked crop, as against 7,500 pounds in the crop put in silo. Allowing then a loss of twenty per cent for fermentation in silo, and no loss in the stored dry fodder, there would be an equal amount of dry substance to feed out.

One hundred pounds of dry matter at time of feeding out would cost, for harvesting alone, 25 cents in the husked crop, and 15⅜ cents in the silo. Add to this the greater efficiency of the dry matter, pound for pound, and it is evident that from an economic standpoint the silo has the advantage.

It may be argued that these results are exceptionally low, but both are equally so, I think, and are fairly comparable, since the labor is charged at the same price in each.

To those who have had experience with both methods of harvesting, it will seem unnecessary to argue that a crop of corn may be disposed of quicker, with less risk on account of weather, and with less actual expenditure for labor, in the silo than in any other way.

KIND OF CORN.

The kind of corn depends upon location. A corn well adapted to Southern New Hampshire might be too late for the northern part of the State. The points of importance are: 1st, to get a variety of corn that will have a large per cent of ears fit to boil by September 5th; 2nd, to get a variety that will produce the largest possible growth, and still meet the first condition.

For a general variety for this State I know of nothing better than the Sanford corn, a white flint corn, intermediate between field and sweet corn. On good soil and with heavy manuring we have produced twenty-five tons per acre; its average product would probably be about fifteen tons. It is a leafy corn, ears heavily, keeps well in the silo, and grows very rapidly.

AMOUNT OF SEED PER ACRE.

Contrary to the practice of many, I have always believed in heavy seeding: One bushel of Southern or Western dent corn, fourteen to sixteen quarts of Sanford, and ten to twelve quarts of Northern field corn per acre, have given better results than a less quantity; on poor soil I would use less, but on well-fertilized land the above quantities are not excessive when planted in rows three feet apart.

THE SILO.

The day of costly silos is past, and it is this fact alone that enables the rapid extension of this system of storage. A wooden silo keeps its contents with less loss than a stone or cement one, chiefly because of the penetration of air through mortar and cement.

A silo built independent of the barn, having its own frame, roof, etc., can be built for one dollar per ton of capacity, if above seventy-five tons capacity. Contracts can be let for the construction of a one hundred ton silo, the contractor to furnish everything, for $100. If built in a corner of the barn, the cost of material and labor will be about one-half that sum; but on most farms, where there is lumber, and where much of the work can be done by the farm help, this cost can be reduced almost, if not quite, to an actual cash outlay of $25.

A silo, 16x16x25 feet, will hold 100 tons. If built in a barn, it will require 40 pieces studding, 3x8, 25 feet long, 2,000 feet; 4 pieces, basement sills, 8x8, 17 feet long, 360 feet; boards for inside walls, 3,500 feet.

The boards should not be over seven inches wide, planed on one side, and the inside course made to break joints with the outside course. Matching the boards is not only useless, but an injury. Common covering boards, free from loose knots, are good enough, and should not cost over $12 per thousand. In many cases the barn frame and studding can be partly utilized, and the above quantity of lumber be considerably reduced. A cement bottom, though not necessary, is desirable.

Don't say "you can't afford to build a silo;" it is just the other way; you can't afford to be without one.

Don't conclude to wait until next year, build one this year; you can easily find time to do it before haying, and then when the early fall frost hits your crop, you will have a place where it can be put at once and saved.

Don't waste money on a stone or cement silo, unless you want to for the fun of the thing; a wooden one is better.

Don't subscribe to the doctrine that ensilage is too watery to be good for anything. Remember that pasture grass in June has more water in it than ensilage has.

Don't plant Western corn, or Southern corn, but get some variety that will perfect the kernels and produce a good number of ears.

Don't forget that you can soon double the supply of fodder by adopting this system; more fodder means more milk, and more milk, more cash.

THINGS TO BE DONE.

Plant two or three acres more of corn as soon as possible.

Select a place in your barn that is convenient, and see how much lumber, and of what dimensions, will be necessary.

Get the lumber, and at odd times put in a silo, and before the fall frosts come, or immediately after, put your corn into it; have it cut into 1½ inch lengths if you can; but if this is too much trouble, pack it in whole.

To sum up: Don't throw this bulletin aside without thinking the matter over, but consider the subject well, and build a fifty-ton silo and try it; the results will convince you.

G. H. WHITCHER,
Director N. H. Agr'l Exp. Sta.

DAIRYING.

[Read by Judge H. BROWN, at the Farmers' Institute held at Tipton, Mo.]

In the present state of affairs, when low prices prevail for almost all kinds of farm products, and the prices realized in many instances are but little if any more than the cost of production, it behooves the farmer, if he would not be driven into bankruptcy, to devise some means by which to improve his condition. That relief is needed no one will deny. What is to be done under the circumstances? I think, to use a general term, that a well-directed economy should be the watchword all along the line, and perhaps to no department of farming industries does this principle more justly apply than that of dairying. Prices for butter and cheese have been declining year by year, until it has become a serious question with many as to whether the business can be profitably prosecuted under the present adverse circumstances. Adulterations and imitations of butter and cheese with oleomargarine, olive and such like compounds in immense quantities of late years have been placed upon our markets and put on sale as genuine dairy products, and by these means dishonest dealers have sought to enrich themselves at the expense of the honest and industrious dairyman. That prices should decline under these conditions was inevitable. This is an evil that can only be remedied by appropriate legislation, and it is the duty of the farmer to see that his rights in this matter are fully protected. Several of the states have passed laws looking to this end, our own State included, but they are objected to on the ground that such laws interfere with commerce between the states; and recently the State law of Pennsylvania was declared by the courts to be unconstitutional on similar grounds, so it would seem that relief full and complete can be had only through National legislation.

Congress not long since passed a law levying an internal revenue tax on such manufactures, and those who took notice at the time will remember what a howl of opposition was raised against the measure by its opponents.

Milk, pure and unadulterated, perhaps more nearly contains all the elements of a perfect food than any article of food consumption known to man, and might very properly be termed nature's own cooking, and is especially adapted to the wants of the young. Milk and its products are very largely consumed as articles of food by a large majority of our population, thus entering intimately into the very life-blood of the people; and I believe I might safely assert that the food of a people most surely leaves its impress upon the nation. We sometimes hear the term "beef-eating Englishmen" used. We might also add butter and cheese-eating, for they are large consumers of both, and are our best customers for these articles; and who will deny that to their diet is largely due this national prestige?

Another cause tending to lower prices is the butter being low grade and not being desirable for table use, and coming in competition with better grades must be sold at a sacrifice, thereby incurring loss to the manufacturer. In looking over the market reports of St. Louis for the week ending January 1, 1891, I find under the head of butter arrivals 32,956 pounds, ranging in price all the way from 3 cents per pound for grease to over 27 cents for fancy. Here is an object-lesson well worth the careful attention and study of the dairyman. Why is this immense difference in prices? It is greater than can be found in any other article of like value in our markets. Perhaps the low-priced was made from cream equal to that from which the fancy grades were manufactured, the difference being mainly in the making and handling. If this be so, what an incentive to improvement is here held out: over 800 per cent difference in favor of a superior article. Let it be remembered that good butter always commands a fair price, and that the demand goes on increasing steadily year by year with the growth of population. I think another thing we might notice is that we do not make all the cheese we consume, but draw supplies from Wisconsin, Western Reserve Ohio and other places. This should not be so; we ought to make more cheese. I see no good reason why we can not. If our people could have a good article of home manufactured cheese it would soon become a staple, and the people would acquire a taste for it, and thus build up a home market for a home product. It is said that a pound of cheese contains as much nutriment as two pounds of beef. If this be so, its use ought to be encouraged on economic grounds. It is said by some that 3 or 4 pounds of cheese can be made to 1 pound of butter. I think this estimate too high, but that it can be made as cheaply as butter, I have no doubt. I am not acquainted with the details of its manufacture, so I will leave that for others to describe.

The dairyman is left to the selection of the kind of cow needed in his business: if for cheese-making, large yield of milk and fair quality; if for sale of milk, good yield and good quality; if for butter, good yield and rich in butter-fats is preferable. I will not attempt to recommend any breed, though some are better than others in this respect; as above stated, it greatly depends on the use for which she is intended. Much has been said as to the amount of butter a cow should produce yearly, and estimates vary greatly, and perhaps no correct estimate of the general average can be given; but it is safe to say that a cow that will not yield 200 pounds had better be sold to the butchers, and another substituted that will. It should be the aim of the dairyman to improve the yield of his herd by careful selection and proper tests; in no other way can he expect improvement. Too much has heretofore been left to chance; it is true that a poor cow can be made better by careful handling, but if she does not possess the natural qualities of a good milker, it is poor economy to waste time on such a subject. Having selected the cows, pure water and abundance of feed are indispensable requisites to success.

Milk is so susceptible to taints and bad odors, that much care should be given to these matters; you cannot have pure, untainted milk from cows that are compelled to drink stagnant and impure water, or fed on unsound and damaged food. It is a well-known fact that certain kinds of food impart unpleasant flavors to milk, such as turnips, bitter herbs, etc.; these articles should be avoided, and such only as are suitably adapted to the wants of the dairy can be used. Of these, the grasses, such as timothy, clover, blue-grass, etc., in summer, and timothy, clover and a liberal supply of grain in winter, are all excellent food, and are to be found in liberal supply on all well-managed farms. Salt at all times should be within reach of the cows.

In winter, cows should be comfortably housed and not allowed to run out in bad weather, as a cow can not be expected to do her best unless she is warm and comfortable. She should be fed all she will consume, and it should be given at regular intervals, so that she will not fret on account of neglect in this particular. Never strike or harshly treat a cow, but always treat her kindly and gently, whatever she may do. I know this is a hard rule to follow, and the milker is pretty apt to be tempted to interchange kicks, especially if she upset him unexpectedly some fine morning; but if you are, don't do it. Much of her unruliness comes from fear and pain in milking or previous bad management. I never knew a cow improved by harsh or unkind treatment, but on the other hand I have known many good cows ruined. Perhaps not one cow in a thousand but will be better for good usage. Try it.

Cows should be milked at regular times, say twice daily, and it should be attended to promptly when the proper time comes round. It will not do to milk at any and all times, just when it is convenient. The milker should see that the teats are well cleaned before commencing to draw the milk; he should then proceed gently and quietly to the task of milking, and should draw it as speedily as possible, consistent with the comfort of the cow, until the operation is completed, which will be when all the milk is well drawn. The last milk drawn is much the richest, and loss may occur by failure to do this thoroughly. Milking also tends to increase the flow, as secretion is thereby encouraged. The milk after it is drawn, if intended for butter-making, should be immediatly strained into vessels for the cream to rise. Different methods of setting are used, each of which have their advocates; these are termed deep and shallow setting. I prefer the deep setting, and use what is called the deep-setting can, holding 3 to 4 gallons, about 8½ inches in diameter, with glass strip in the sides, so that the rise of the cream can be observed. I think they are easier handled, and hold more milk than shallow pans, and not so much surface is exposed to the atmosphere. I think the cream rises sooner in them than shallow setting. A temperature of say 45 degrees Fahrenheit should be maintained while the cream is rising, which will be in about 24 hours. When thorough separation takes place, the cream should be skimmed off and put in a vessel in a cool place to ripen—not over 58 degrees. If not skimmed when fully risen, the acid principle in the milk will begin to consume the cream, and there will be a loss. More cream may be added if not sufficient to churn, stirring it well each time cream is added, so as to thoroughly mix and ripen. No cream should be added for at least 12 hours before churning, as there is not sufficient time for it to ripen, and much of it would remain in the milk after churning. When the cream has sufficiently ripened, which is when it has become slightly sour and somewhat thickened, it should be churned—the proper temperature being about 62 to 64 degrees. Should the temperature be too low, butter will be long in coming and milk will foam; if too warm will come sooner, but butter will be inferior and lose color and texture. Churning should be stopped after the butter has well gathered, as too long churning makes it pasty. The milk should be then drawn off and the butter thoroughly washed in cold water until all of the milk is worked out of the butter, and then salted with fine dairy salt—Ashton's is perhaps as good as any in quality—about one ounce to the pound of butter; it should then be well worked and packed in vessels, and if properly done and the butter is sufficiently cool, nothing else will be necessary. I know some contend that butter needs working over, but my experience has been that the more you handle butter beyond what is actually necessary does more harm than good. Always use a ladle for working butter, never using the hands, as that will make it oily at the point of contact.

Good butter cannot be had without observing the utmost cleanliness from the time the milk is drawn until the butter is packed, and then it should not come in contact with foul odor or be kept at a warm temperature.

These are a few of the rules to be observed in butter-making, and if well followed promise a full degree of success; but after all, much must be left to the experience and judgment of the dairyman. Milk is so susceptible to atmospheric changes and other suitable influences that none, however skillful, can certainly count on absolute results, but must perforce be satisfied with the ability to overcome some of the difficulties of the situation.

Comparatively few are aware of the magnitude of the dairy interest of the United States. I have no estimate of the annual total product of butter and cheese, but as far back as 1877, the Chief of the Bureau of Statistics on commerce and navigation estimates total butter produced 950,000,000, cheese, 310,000,000—the value in New York State alone for the year 1880, for all dairy products, being $12,395,353; and during that year our exports were as follows: Butter, 39,226,658 lbs., cheese, 127,553,907 lbs., in value nearly $19,000,000. Under the article on exports of beef and its products, I cite as follows: The value of cheese is nearly double that of any other product in the schedule, and the United Kingdom takes 96 per cent of all exported. For Herkimer county, New York, perhaps the banner county in the United States, I note statistics, tenth census, for 1880: Milch cows, 48,237; milk, 16,638,733 gallons; butter, 1,402,922 lbs.; cheese, 2,862,334 lbs. Same for Moniteau county, Missouri: Milch cows, 4,998; milk, 9,673 gallons; butter, 174,135 lbs.; cheese, 2,642 lbs.

I might go on through the list, but this is enough to show what vast wealth and interests are involved in the business. I take Herkimer county, New York, as an example. If her people, with their high-priced lands, her population, her other varied industries, can build up such an immense dairy business and conduct it profitably, surely our people, with their cheap lands and fertile soils, temperate climate, inexhaustible water supply, luxuriant pastures, our large hay and cereal crops, backed up by the pluck, perseverance, skill and indomitable energy, with intelligence inferior to none, I think we can do likewise. What Herkimer has done, I believe it possible for us to do. Shall we profit by this example, or shall we shut our eyes to our grand possibilities and plod along in the same old beaten way? Time will tell.

[We commend to our farmer friends a careful perusal of the article on "Dairying," by Judge H. Brown, published in this issue. It is the conclusions of a thoroughly practical farmer, after long years of experience and observation, and is full of sensible instructions and important facts. This paper was prepared to be read at the recent Farmers' Institute in this city, but by some oversight was not read. It is safe to say that nothing submitted to that meeting on this subject was abler or presented in a more entertaining manner.—Tipton Times.]

PROFIT IN DAIRYING.

(A paper by JOHN PATTERSON, Kirksville, Mo., read at the Farmers' Institute held at Edina, Mo)

In noting the condition or outlook for farmers to make money at any branch of farming, I think one could easily get perplexed and come to a short conclusion that there is no chance to make it at anything. The beef business is ruined; the ranchman in the wide wild West can raise beef at the prices now going and make some money, but a farmer, even on low-priced land, cannot hire help and either raise or buy feed and gain anything.

Hogs require corn, and much land has already run in corn until its paying productive power is exhausted. Horses may be good to a man who has skill, judgment and capital sufficient for it, but it is the hardest stock to get into, and takes a long time to get good returns for outlay. Sheep may be profitable, but are not always so, many farms being entirely unfit for them because there are cockle-burrs on the land; sheep and cockle-burrs should never be put together. Besides that, dogs are a great bother, and often in one night can ruin more than the profit from a flock for a whole year. I always keep a small flock, and find they pay well, compared with anything else.

I once took a notion to make it my main business, and had a flock of 500; then dogs came and destroyed 100 in less than a week; that took my enthusiasm away.

I have always kept a number of cows and made butter or sold milk to factory when could do so to any profit. I have found that any feed which will make a pound of meat will make a pound of butter, and that led me to compare returns. Neat beef I get from 3 to 8 cents per pound, and for butter from 10 to 27 cents, or an average of near 18 cents per pound, besides some profit on skim and butter-milk. Besides, dairying has much with it which will make better farms instead of running them down. In raising beef, a common way is to let cattle run on the meadow and feed the hay to them there. Many farmers think and argue they will return to the field what they take off it. But I practiced it a long time; I would stack forty acres of grass in a place and provide boxes to feed in as convenient as I could; that land next to the stock-yard would have a coarse light grass which nothing liked, and a little way from there it showed nothing and was as poor as ever.

The grass from forty acres of good meadow fed to cows and hauled out and scattered regularly over fall-plowed meadow will spread over six acres, and will show a good return for six years. I want to say right here I don't believe in plowing manure under; more than half its value is lost. Plow the land first and harrow the manure in. In keeping cows for a business, any man will soon find himself compelled to have barns for them, and they should be made comfortable and convenient—the upper story to hold all the hay they need. Stacking hay is wasteful, and should never be practiced by any one able to build a shed or barn to put it in. I have studied our condition as to possibility of making anything at farming, and feel convinced this is our best opening, and if we learn to do it right we can make some money and soon double the productiveness of our land.

I think we are in somewhat the same condition Wisconsin was some years ago. They had been raising wheat until their land would produce no more, and the price fell at the same time. A Mr. Hoard and Hiram Smith and some others took the lead in dairy matters, practiced it and talked it, and the population there being more Eastern, whose people are proverbial for being willing to work at a small business very close if there is money in it, and who take instruction very readily, in a great portion of the State to-day dairying is the main business. They have enriched their lands, produce the best of abundant feed, keep the best of butter breeds, have the best manufacturers, and the average price for their butter last year was 21 cents. Many counties have fifteen or twenty factories in them.

They rewarded Mr. Hoard for his leading them into that business by electing him Governor of the State, and now that his term is just out he wants to go home to his farm and dairy, and a paper called Hoard's Dairyman; but he may be run for our next U. S. President, and I feel confident if we get him we will have a good man. This is a digression from my subject.

Where I think we are like Wisconsin is, our main occupation, I mean the beef business, has failed us; we can no longer follow it as our main business, and I think it would be well for us to choose dairying: if we will go at it largely and by communities, we will stand a much better chance for making money than as isolated individuals. It requires more hands to run a dairy, but the returns are enough better to make it pay. One thing to recommend dairying is that you get money often —once every week or two as you desire—while in the beef business you must wait that many years, and sometimes more.

We may look over our situation as much as we please; it will never do to give it up. Our only hope for remedy is to learn to do it better so as to be more advantage to us.

The first thing I would urge is to adopt a judicious rotation. I fancy I am talking with a good old farmer and he will tell me he adopted that long ago. I ask him how his rotation runs; he says he plows up his meadow, takes two or three crops of corn, then two crops of oats, and then sows it to clover and timothy and lets it stay in meadow so long as it produces good grass. Then he does that same over again.

That is rotation with a vengeance: what fertility corn crops could not take out the oats crop could, and many such rounds will so impoverish the land that soon it will not produce grass, but just stunted rag-weed. I believe that our former Professor J. W. Sanborn's rotation is the best we could contrive, provided we could raise wheat here. His was to plow up meadow and plant corn, take only one crop of corn, sow oats one crop, following with clover, and plow under second growth and sow wheat, seeding timothy with wheat and let it remain two years, then plow it up for corn again.

That makes a six years' rotation. After hearing him I wanted to adopt it, but thought wheat would not do here, so I plowed meadow in fall; hauled all the manure I made on it in winter; harrowed and planted barley in spring; next oats and clover and timothy; sowed on after oats was harrowed in and let it remain in grass four years. The fault I find with that rotation is by the time I plow the grass, I have no clover, and I think it would be the cheapest way to manure; and I want now to change to Sanborn's rotation as quick as I can, for I have got to believe that if I had a good clover-sod to plow under I could raise wheat.

With rotation, and barns sufficient to put all our feed and stock in and take care of the manure, we can make enough to manure one per cent of our land each year at from twenty to twenty-five loads per acre. But that will require the corn-fodder to be saved also. I am now trying a plan to fix it so I can feed it in barn, get nearly all eaten to go in manure. I have a No. 14 corn and fodder-cutter. I can cut a ton in an hour from 1-4 to 1-2 inch long, and it makes very fine feed and nearly all is eaten, as the fodder now is very good. I think every hill of corn should be cut and utilized as carefully as hay, for it is as good feed.

This rotation, I think, has many advantages over our common way of farming. The land, if well manured, will gain in fertility, will not wash, and all sorts of weeds can be most successfully exterminated, especially the cockle-burr, and if I had that burr on my farm, I should adopt rotation of crops to rid myself of it if for no other reason. Very lately we have another weed, called by some cotton-weed and by others butter-print weed, which, I think, will be worse than the cockle-burr to get rid of. Next is a very bad, coarse taggy thistle, which asks nothing about who has the deed to the land, but quietly takes possession and multiplies awfully, and nothing can grow near it. I think we need some legislation against them, for if I keep my land clean of them my neighbor may not bother them, and the downs can fly all over my land, and my work be for nothing so long as his are allowed to stand there. They can be killed by cutting them off under the crown of the roots any time before they bloom, and farmers all over the country should combat them before they get too much started, for after they get thick it will cost more to clean land of them than it will be worth after it is cleaned. I would not knowingly have one go to seed and scatter its downs for a dollar each; yet I find many farmers who do not know them from the common soft thistle which used to be here, and never try to kill them.

I was intending to speak more on dairying. It is now about twenty years since the Elgin district commenced business, and what struck me the most was that no matter how many may go into the business, there is never a word about there being too many in it, and while a greater number are engaging in the work, the old ones are enlarging their business.

I fear many farmers in this State are as the ones Hiram Smith describes, who will not go and hear talks on subjects which vitally concern them, nor will they subscribe for papers, nor buy books, never realizing how much they need them, nor how much they might be benefited. When farmers, as a class, will hear, read, talk and practice what they can learn, I am confident we will see great improvements.

JERSEYS IN THE DAIRY.

[By W. F. PACK, Ellnburg, Mo., read at the Farmers' Institute, held at Trenton, Mo.]

A large majority of our farmers, with anxious faces, are asking the question, day by day, why can not we make the farm pay as of yore? We work hard, but we get nothing for our produce.

Twenty years ago any industrious farmer could make a good living and lay up a little money every year by raising wheat, cattle, hogs and horses in any of the Western states; but all this has been changed. The rapid growth of the great cattle companies who have millions of dollars invested in cattle that roam over the vast feeding grounds of the Southwest, where nature furnishes feed with lavish hand the year round, with no expense for farm machinery for raising crops to feed cattle, as we are obliged to do during the five or six months of severe winter weather. There, too, one man can attend to five times as many cattle as he can in the states further north.

The same conditions also hold good in respect to raising wheat, as it can be raised and marketed and leave a fair margin of profit in the immense wheat fields of the great Northwest for less than the actual cost of plowing and harvesting it in the older states.

It is very evident, then, that if we would prosper we

MUST CHANGE OUR METHODS.

Wherever a community changes from the old methods, prosperity seems to dawn upon them at once, and gradually there appear signs of thrift on every hand, in improved buildings, fences, vehicles, etc.

How shall you make the change? You have cattle, sheep, hogs or horses or land—too much land, no doubt. Sell something, even if you must sacrifice it, and invest in a few *good* dairy cows.

One hundred acres of ordinarily good land is ample for the support of fifty head, which will yield you from $30 to $75 a year each, an income of $1,500 to $3,750 a year.

In this age of specialties and intense industry, do not try to follow the old-fashioned general purpose idea, by trying to dairy with a cow that has spent her life in making beef, but sell your beef cows, and let every three beef cows buy one good dairy cow.

There are several good dairy breeds, but the Jersey has some qualifications which place her at least in the front rank, if not away beyond the competition of other breeds, as I will attempt to show further on.

Schreiber

It takes but little less than four gallons of milk from an ordinary native, or a grade short-horn cow, to make a pound of butter, while it takes less than two gallons of ordinarily good Jersey milk to make a pound of much better butter, which will bring one-third to one-half more money in the same market. There are numbers of Jerseys that make a pound of golden, gilt edged butter from only one gallon of milk. So highly estimated is Jersey butter in many of our large cities, that there are some Jersey butter makers who get as high as 75 cents per pound the year round for their butter.

While there are other breeds that show large records in weekly tests of individual cows, there is no breed which can show such a large yearly record in individual animals and herds as can the Jersey.

A few among the number are:

	Lb.	Oz.
Jersey Queen of Barnet	851	1
Mary Anne of St. Lambert	867	14
Landseer's Fancy	936	14
Eurotisama	945	9

There are many herds that average 400 pounds or over per cow in a year.

Numerous tests show also that the Jersey will, for the amount of food consumed, produce far more butter than any other breed, and this is an important item. One test in particular was made by Mr. James Long, one of the commissioners sent from England to examine the dairies of Holland. He says:

"We found, when on grass, the Jersey gave one pound of butter for every thirty-two pounds of feed, while their other dairy cattle gave one pound of butter for every fifty-five pounds feed. When stall-fed, the Jerseys produced one pound of butter to every fifty-seven pounds of feed, while their other cattle required 113 pounds of feed to produce one pound of butter."

There is another point in favor of the Jersey which makes her pre-eminently the dairy queen. Careful chemical analysis shows that Jersey milk is nearer like human milk than that of any other breed, as the following table will show:

	Jersey milk.	Human milk.
Water	85.28	85.33
Solids	14.72	14.67
Caseine	3.67	1.62
Fat	5.21	5.48
Sugar	4.90	7.12

This you will observe shows a difference mainly in caseine and sugar, and even here there is a variation of only about two per cent in each.

Prof. Hunter Nicholson, author of a series of articles on the "Chemistry of Milk," and who has a national reputation as a dairyman, says: "The chemical difference between Jersey milk and that of other breeds, shows that the Jersey product is much more digestible."

He then gives the following practical test of this quality. He says: ‘I have been furnishing a friend with milk from my richest cow for his child two years of age that could not digest the milk of ordinary cows. The result is that the child has become stout and healthy." The same authority says also: "The breed flavor of Jersey butter is as distinct as its color."

A gentleman in Kansas City, Mo., tried to raise his first three children on the milk of native cows. One after another they died. His family physician prescribed Jersey milk for the fourth. The child flourished on it; is now alive, in excellent health and over two years old.

Hundreds of instances of this nature could be given if time and space would permit.

NERVOUS FORCE.

The higher we go in the order of creation in the animal kingdom, the greater the amount of nervous force. Darwin tell us that the ordinary angle-worm, which is very low in the animal kingdom, feels scarcely any greater pain when its body is cut in two than a highly organized human being feels from a severe pin-scratch.

That the Jersey is highly organized in point of nervous force is an acknowledged fact. This gives a subtle character to her product which places it away beyond the competition of all other breeds, and constitutes her truly the queen of the dairy.

DAIRY COWS.

[An address by H. L. Burris, of Clinton, Mo., before the Farmers' Institutes of the State by the State Board of Agriculture.]

This subject has been written upon by many; read of by all; hence, each of us, in our respective opinion, know all about the dairy cow; and if I am only able to add line upon line without giving you any practical information upon the subject, the committee having this matter in charge are responsible. They insisted that I should occupy this, your valuable time.

We have several breeds of cattle having distinct characteristics and resemblances peculiarly their own as a breed, and, if intelligence and care has been given, their offspring will almost without exception be equal, if not superior, to their sire and dam.

We have cattle inheriting different blood and different characteristics, and to a greater or less extent, individually differing from others, and the lack of an established position and character is seen when their offspring come to maturity, or to an age when they should develop their full ability. Some of these breeds, and indeed some individual animals of many make-ups, inherit and develop by food and care great and rapid growth, early maturity and profitable beef, others to great quantities of milk, and others, great richness in butter-fat. I may have included all, but the all-purpose cow says no.

All these, without regard to time, breed, size, form or color, must be fed; and, as they have not all inherited and developed the ability and disposition to work the same kind and quantity of food into the same kind of product profitably, surely they should not be fed alike. Some cows will make profitable use of food, converting it into beef. They are not, however, profitable dairy cows. Others will, by different processes, convert it into a larger quantity of milk best adapted to make cheese, and others by a process peculiarly their own, grind and extract all the nutriment and give it in milk rich in butter-fat. Others will consume a great quantity, and not being able to work it up properly, cast it off in manure.

Now what constitutes a profitable dairy cow in her individual make-up, and what will make her profitable to us in the use of her, can be told in a few words, yet there are many influences and conditions affecting the cow and the results obtained which cannot be given in this paper.

The cow should have inherited and developed by growth a strong constitution, full of vigor and activity, a good frame, with ample room for lungs and digestive organs; a strong desire to get much food, and all other organs well constructed, each assisting the other in grinding, mixing, extracting and bringing together all the nutritious elements of her food, distributing through her system only sufficient amount to keep her in good, vigorous health and disposition. and the other deposits in her udder, and yield to the milker a large amount of rich, wholesome milk. She should have a large yielding udder, well up behind, and full in front, with teats of good size and well apart. She should have a good disposition, not necessarily of the Christian virtue kind, which when pounded upon one cheek will turn the other also.

But, I am asked, are you going to have a cow without legs, hair, tongue, tail and horns?

Oh, no! since nature has provided them we must accept of them as factors, and for fear I will be accused of being prejudiced and not giving them their due recognition, will say she must have legs, either straight or crooked; and with my thirty years of experience milking cows, I am unable to tell which will give the milk-bucket the greatest momentum, and revolve it upon its axis the oftenest just as the bucket is full of milk.

Hair she must have, and if it is all of one color it will not get in the milk-bucket while milking in shedding time—it is listed so.

A tail she must have, and a small, flexible one with a long black switch is preferable. A large, clubby one might knock you down, but a small, long one wrapped two or three times around your face and neck while milking in fly time, brings you in quite close relation to the cow.

A tongue is more ornamental and useful by being black. When she licks you in the face at night pleading for more food, you will not be disturbed with but one of the seven senses. And last, though not least, she must have horns, though she runs the milk-maid out of the yard, tears down your fence and leads the whole herd of cattle into your corn-field just at roasting-ear time, and in the round-up, toss the dog that worried the cat, to be brought up at night and dosed with lard, bacon, oil and salts, all because she has such useful and beautiful horns.

Thus she is built and endowed with all these attributes, most of them essential in assisting each other in these several functions. The cow will not say, I have no need for the least of these attributes, but the practical dairymen will say to the cow, you and I have no need of your horns—"they must go."

Thus she stands before us a perfect machine in her organic system, capable and desirous of manufacturing a great quantity of wholesome food into more or less milk of greater or less richness.

She might be compared to a mill having a good foundation, good strong walls and a perfect equipment of machinery for receiving and carrying the grain through the various processes of grinding and separating, and finally sacking the greatest quantity and best quality of flour.

These almost perfect mechanical devices, each performing its respective duty and assisting each other, would be comparatively useless without an intelligent and skilled miller to oversee the whole process.

We have cows of greater capacity as regards quantity and quality of product than we give credit for. They are willing and capable of making a better and greater product, but as millers, are we feeding wholesome, nutritous food, to the extent of each individual's capacity? Are we watchful and careful in all the details and contingencies that daily arise? In fact, do we expect something for nothing? Does the product please our patrons in quality, and does the quantity and product pay a reasonable profit? If not, why not?

There are too many cows kept that never have and never will be profitable dairy cows, no matter who the feeder is, or what the cow is fed. If of a beef-breed, or disposed to take on fat easily, the increase of food given will be worked into fat, and tucked away on her ribs, instead of working it into rich milk. If a hap-hazard, anything of a cow, the increase of food may cause an increase of thin, poor milk, but the greater part of its nutritious substance, undigested and without having its rich properties extracted and converted into rich milk, will be cast off in manure.

If an all-purpose cow, she raises a calf yearly, gives three or four gallons of milk a day when fresh, rapidly shrinks in milk, and when the calf is weaned is dry, at the time of year when her milk is needed the most. She runs in a poor pasture through the summer, has the privilege of picking up the rotten and smutty ears of corn in a stalk-field in January, and in the spring is permitted to inhale the fragrance and rich aroma of a straw stack. And after many years, having raised many calves, and each spring raised many high expectations and hopes in her owner's mind of her near future greatness, only to be regularly and absolutely disappointed, how fortunate she is an all-purpose cow. Had she not been, kind Providence and her owner surely would not have spared her life to ripe old age. She has her mission nearly filled. Placing her upon scales we read: "I have kept you many years, your milk has been irregular, your butter won't gather, your calves are jacks of all trades and profitable in none. Your time has come and I will soon reap the full fruition of my long-hoped-for profit." I straightway commence feeding her Yankee pumpkins and nubbins of corn, knowing there is an immense quantity of beef in her after I have fed her all of my available crops—her time has come. I butcher the old cow. Finding I have more than I can use in a year (my teeth are poor), I seek my neighbor to sell him some ripe beef. He, to my astonishment, will not give me over two cents per pound, and don't care about it at that. Not wishing to make this matter worse, or longer extend my disappointed thoughts, I told him to take it. Wasn't I happy? Shouldn't I be? I have got rid of the all-purpose cow.

MILK TESTING.

[Presented at the Farmers' Institutes by C. P. Fox, assistant chemist of Agricultural Experiment station.]

Of the many questions of importance to farmers, dairymen and those engaged in operating creameries and cheese factories, none are more practical than those relating to the testing of milk—practical because their value may be recorded in dollars and cents. A milk test is of value to the farmer because it will enable him to improve his herd by weeding out those whose milk is low in butter fat. Two cows may require the same amount of food and care, yet one may produce a milk containing 4 per cent of fat while the other contains but 3 per cent. Are they of equal value in the production of butter?

In less than a century the sugar contents of the beet have been more than doubled. The major element in this great change has been careful selection. Notice with what care the German and French beet-grower selects his seed. Every beet is subjected to the most rigid analysis, and only those reaching a certain standard are planted.

If such is possible with the beet, why can we not improve the quality of the milk of our herds in the same manner? To the creamery and cheese manufacturer it is of more value. Until the last year or so it had been, and is yet, the custom of those buying milk to pay for it by the pound or gallon regardless of the fatty contents. Such methods induced the patrons to furnish milk rich in quantity but poor in quality. The buyers placed too much confidence in the supposed uniformity of milk. Milk is a very variable substance. Its quality differs widely in different breeds and in individuals of the same breed. It is easily affected by food and physical condition of the animal.

In 178 analyses of milk made by the Agricultural Department at Washington, the per cent of butter-fat ranged from 2.61 to 6.05 per cent —a difference of 3.44 per cent.

From these figures it is evident that this method of buying milk is not just to either party; in one case unfair to the consumer and in the other to the seller. By testing each patron's milk and paying only for the actual fat contained would be far more rational and be perfectly fair to all concerned. I am glad to say that many creameries have adopted this method since the introduction of the rapid and easy methods of estimating the butter fat.

EASY AND RAPID METHODS OF ESTIMATING THE BUTTER-FAT IN MILK AND CREAM.

The application of volumetric analysis to the determination of butter-fat in milk is comparatively new, and no other subject of chemical science has received more attention than this.

Until the latter part of 1887 the gravimetric methods of determining the fat in milk had been in general use. The gravimetric method, requiring an expensive balance and skill in manipulating delicate apparatus, placed milk analysis beyond the reach of all except analytical chemists.

At the above mentioned date, Prof. Short, Assistant Chemist of the Wisconsin Experiment Station, gave to the public a quick, easy and fairly accurate method of estimating the fatty contents of milk. Failyer and Willard, Kansas Experiment Station, attempted to remedy the objectionable feature of the Short method (the length of time required to complete an analysis). They succeeded in reducing the time from four hours to twenty-five minutes—the results comparable with those obtained by the churn.

About this time, Parsons, of the New Hampshire Experiment Station, perfected his method. (First Annual Report of New Hampshire Experiment Station.) A very accurate method and is applicable to buttermilk, milk and cream.

In June, 1889, Cochran obtained a patent on a milk-testing apparatus. In the latter part of '89, Patrick, of the Iowa Station, brought out what is known as the "Iowa State Milk-Test."

The Wisconsin and Vermont Stations have the honor of presenting the latest methods. It will be unnecessary to describe in detail all of the above methods. A few general remarks and a description of one or more will suffice. The underlying principle of the various methods is the same.

It consists in dissolving the non-fatty constituents of the milk, and thus permitting the fat to rise to the surface. The solution is effected by the aid of chemicals (sulphuric, hydrochloric and acetic acid); while the ascension of the fat is aided by heat and some solvents like ether, gasoline or amyl alcohol. The column of fat is in some cases measured in narrow tubes graduated in per cent, while in other cases the readings refer to a table in which the percentage corresponding to the reading may be found.

The process of dissolving the caseine and separation of the fat usually requires a great deal of time and skillful treatment.

Dr. Babcock (Wisconsin Station) obviates this by the employment of centrifugal force. The question now is, "Which test shall I use?" The Vermont Station in a recent bulletin sums up the conditions of a good milk test as follows: First, accuracy; second, simplicity; third, cheapness; fourth, rapidity.

Accuracy.—All of the above mentioned methods are quite accurate enough for all practicable purposes. They have in each case been tested carefully by standard gravimetric methods. The only error that can creep in is by use of inaccurate measuring tubes. Already much complaint has been made about the inaccuracy of many of the tubes now on the market. The Iowa Station tests all tubes before they are sent out, thus insuring an accurate calculation.

Second, simplicity.—Beyond a doubt the Babcock test is the most simple. Next is the Short's. (The writer is not familiar with the practical workings of the Vermont test.)

Third, cheapness.—Dr. E. H. Farrengton, assistant chemist of the Illinois Experiment Station, has recently made some experiments with several of the methods in order to ascertain the cost. He found that the estimated cost for chemicals, per analysis, was 1 cent by Cochran method, and 1 cent by Iowa Station test. The cost in the Babcock test is about one-half cent per test. The Vermont Station ———.

The cost of the apparatus is the main item. Several sizes of each test are on the market.

Short's apparatus complete, 12 bottle tester....	$10 00
Babcock's " " 10 " "	15 00
Cochran's " " 6 " "	10 00
Parsons' " " 6 " "	10 00
Patrick's " " 6 " "	6 00
Vermont " " 12 " "	25 00

Failyer & Willard's tester can not be obtained.

The breakage will be about the same in each method.

Rapidity.—The different methods vary greatly in this particular.

The experiments made at the Illinois Station show that Short's test required 3½ hours, Parsons' 2½, Failyer & Willard's ½, Cochran's ½, Patrick's 20 minutes, Babcock's test about 15 minutes.

SOME THINGS TO BE OBSERVED.

Sampling the milk, no matter what method is used, if accurate results are desired care must be taken in drawing the sample. The milk should be well shaken or poured from one vessel into another in quick succession just before drawing the amount required for the test. The pouring should be done carefully, or a large quantity of air bubbles will be entrapped in the fluid. When more than one test is to be made the pouring should be repeated each time. The sample should be fresh if possible, as sour (thick) milk is hard to mix. In creameries where it is not convenient to test daily each lot of milk received, a small sample may be taken each day, placed in a suitable reservoir, and once a week a sample from the reservoir may be drawn and tested in the usual way.

To prevent decomposition, Prof. Patrick gives the following formula: Mercuric chloride, 10 parts; aniline rose pink, 3 B. 1 part; powdered borax, 50 parts.

Of this mixture, 10 grains will preserve the mixture collected during the week. In cold weather not so much will be required, while in hot the quantity must be increased. The mixture is highly poisonous. While the aniline serves as an indication of its presence, those using it must handle with care.

HANDLING AND CARE OF APPARATUS.

The greater part of these apparatus consists of delicate glassware. They are constructed of annealed glass, so there is not a great deal of danger of breaking the apparatus by heat. Breaking usually results from careless handling. A block of wood with holes large enough to receive the measuring flask while filling and reading is of service. Some sort of a rack to hold the pipettes is also desirable. All pieces should be cleansed immediately after using. The bottles clean much easier while warm than when cold.

Acids should be handled with care. If spilled upon hands or clothing, apply ammonia and water, or if ammonia is not handy, use baking soda and water. With the methods using gasoline or ether, special care must be taken that the vapors of these substances do not come in contact with fire. Bottles containing them must be kept tightly corked.

In testing milk, care should be taken that the conditions are alike in all cases, acids of equal strength and thorough shaking, same temperature when reading the per cent—in fact, the entire manipulation should in every case be identical.

In every case follow closely the printed directions that are sent with each set of apparatus; observe these and you will get uniform results. These remarks cover the most important points.

If any of you are interested in milk testing, I will give you a list of references of literature that you can look up yourself.

Bulletin No. 16, Wisconsin Station, Short's Method.

First Annual Report of Kansas Experiment Station, Failyer & Willard.

First Annual Report New Hampshire Station, Parsons' Method.

Bulletin No. 17, Cornell Experiment Station, Cochran's Method.

Bulletins 7, 8, 9, 11, Iowa Station, Patrick's Method.

Bulletin No. 24, Wisconsin Station, Babcock's Method.

Bulletin No. 20, Vermont Station, Biemling's Method.

Bulletin No. 16, Illinois Station, Milk Test.

Bulletin No. 12, Pennsylvania Station, Milk Testing.

Any of these publications can be obtained by addressing the above stations.

CONCLUSION.

It is not our intention to advertise either of these methods or to favor one more than another. We can only state their faults and their merits.

Short's Method requires too much time.

Failyer and Willard's needs too much skill in operating; it is a laboratory method.

Parsons' also requires a great deal of skill, and the results are usually lower than those obtained by many of the other methods.

The Cornell and Pennsylvania Stations highly recommend the Cochran Method to dairymen. This method is patented; the right to use must be purchased. Like the method of Parsons, the readings refer to a table from which the percentage of fat is taken.

The Iowa Station Method (Patrick's) contains some commendable features, among which are the accuracy of the measuring tubes and the adaptation of the apparatus to every-day farm life.

The Babcock and Biemling (Vermont) Methods are, however, better suited to the needs of both farmer and creamery.

Of the two methods the Babcock's, is the more simple in regard to mechanical construction; the Vermont Station Test is better suited for creameries where steam or water-power is available.

DOES IT PAY TO TEST COWS?

To answer the above question, we would simply refer the readers of the Dairy Column to a test that was made of 11 cows in a private dairy in Southern Illinois. We give the weight of milk produced by each cow per day. This multiplied by the per cent of fat gives the amount of butter-fat produced daily by each cow. This amount multiplied by 26 cents (which was the price received for butter) gives the money value of each cow's milk in butter per day.

	Lbs. milk.	Per cwt. butter-fat	Lbs. butter per day.	Cents.
Sleepy	23.7	4.4	1.04	.26
Crooked Horn	12.7	4.7	.60	.16
Jimmy	15.	5.7	.85	.23
Joe	10.	5.6	.56	.14½
Daisy	22.5	4.	.90	.23
Jessie	18.7	4.5	.84	.22
Long Horns	21.2	4.4	.93	.25
Mouse	11.2	4.6	.51	.13
Doney	8.7	4.9	.42	.11
Polly	11.2	4.9	.55	.14
Totes	16.2	3.	.49	.13

It will be observed that the daily income of these cows was from 11 to 26 cents per day. An average of five of the poorest was 13 cents a day; an average of five of the best was 24 cents per day. Of course there are some things that should be taken into consideration. The young heifers could not be expected to do as well as mature cows. Some of the cows had been giving milk six months, while others only one month. There is little doubt, however, but that if the five poorest cows were disposed of and the extra care and feed given to the five best cows, the profits from the dairy per cow could be nearly doubled. So much for the private dairyman.

At a number of farmers' institutes held in Missouri, milk was tested which varied in butter-fat from individual cows from 3 per cent to 10 per cent. Buttermilk tested varied from 6 to 3.2. Skim milk varied .5 to 2 per cent.

Here is a lesson for dairymen, as no one can afford to throw away half of the butter-fat produced, either in the skim milk or buttermilk, which is the case when carelessly handled. At the Missouri State Dairy Convention, at Jefferson City, a sample of milk from the first pint and one from the last pint of milk taken from the same cow, tested 1.6 for the first pint and 8.8 for the last pint. This is a practical lesson in the necessity of milking cows dry. At the Nebraska State Dairy Association, held at Pawnee City, fresh milk tested from 3.5 to 4.8, skim milk 36 hours, deep setting, .5; skim milk, 24 hours, deep setting, .55; skim milk, from crocks .8. Centrifugal skim milk from a horizontal hand separator, which was run at the meeting, showed less than .1 per cent butter-fat. At Kansas City, milk was tested as shipped to the Missouri & Kansas Dairy Association, which showed from 2.9 to 4.2 per cent butter-fat. The standard of butter-fat for Kansas City is 3 per cent. This Association guarantees every pint of milk sold to be equal or superior to standard. Hence it was found that they were selling some milk that was not up to standard, provided this patron's milk was not mixed with others.

With these facts and figures before us, can any private dairyman or dealer in milk, either in creamery or for commercial purposes, afford to buy milk by the gallon or hundred pounds, regardless of its butter value, when a Babcock milk test can be bought for $8?—J. Y. SAWYER, in Dairy Column.

The Franklin County Creamery Association, of St. Albans, Vermont, announces that they will in the future test each patron's milk by the most reliable process, and pay for the same according to its butter value.

CHEESE-MAKING.

[A paper read by W. F. HABERSTAAT at the Farmers' Institute in Appleton City, Mo., Jan. 9, 1891.]

In cheese-making, the most essential part is to have first-class quality of milk, which rests with the producer entirely.

See to it that the cows have good, fresh, healthful food and good fresh water. This last is very much neglected. Do not let the cows stand in a pond where they drop all manure and then let them drink the same, or you will surely have poisonous and unhealthy milk. Do not run the cows with dogs or otherwise, or they will become overheated and injure the milk. Be very gentle in milking, so the cows may not get nervous, as that condition aids to producing bad milk. I would advise tying the cows up while milking.

Milk with a bad flavor will be, when set in a glass to sour, like a sponge, and should not be used, for that appearance is evidence of decay.

After milking, the milk should receive proper care before leaving it for the night. The milk should be properly cooled, or in other words, the animal heat taken from it, by dipping it with a dipper to the top of the can, that the air may carry off the heat; continue this until the milk is about as cool as the atmosphere, and it will keep good and sweet and surely be the best for cheese. Some people, and I think the most in this section, set the milk in cold water through the night and neglect stirring it, and I know, kept in this way, the life of the milk will be killed, which will keep the same from ripening, which is very necessary for good cheese.

Now, I wish to speak of the consumption of cheese. This very important article of food is held much as a luxury, but should not be, for its nutritive elements rank above those of lean beef or butter.

While beef-steak sells at from 10 cents to 15 cents per pound, cheese sells at 10 cents, and in summer, at wholesale, even less; so we see cheese is cheaper and a more nutritive article of diet.

Now, I wish the Agricultural board to advise the Legislature to pass a law which will require the use of cheese in all poor-houses and prisons, or other places supported from the State or county, at least three times a week. Such a law would help the consumption somewhat, and also help the farmer. We would soon receive better prices for our cheese, and there would be better demand for cows.

If Missouri would adopt this, other states would follow.

If cheese was used regularly in the War and Navy departments, and the different boarding schools, where it is now served very sparingly, or not at all, it would help out the home market, so that we should not have to depend on the foreign market.

I would also advise cheese-making on the Agricultural College farm, having there a man who thoroughly understands the work, so that the Agricultural College students might receive instruction, which would insure as good cheese being made in this State as elsewhere; which can be done.

HOW TO MAKE DAIRYING PROFITABLE.

C. P. Goodrich, of Fort Atkinson, Wis., gives a short talk "How to make dairying profitable," as follows: "The only way to find out about anything is to keep an accurate account. Different cows must be tested as individuals. One must first find out how unprofitable dairying is under the old plan. The first item is to reduce the cost of production. We feed each cow $30 of feed per year, consisting of one acre of pasture, $5; five tons ensilage, $5; one ton clover hay, $5; one ton bran, $15; and make from each cow 320 pounds of butter, costing for food per pound of butter, say 10 cents. We estimate the cost of care and making butter at $20 per year per cow, making a total cost of $50 per year for feed and labor. We get in return 320 pounds of butter, which we sell at 24 cents, $76.80; skim milk worth $10; calf worth $3; a total of practically $90, or a profit of 80 per cent on his $50 invested. Without the silo it would cost at least $40 per cow. Good care is a great factor in reducing cost of production. One day's exposure to a cold October rain reduced my twenty cows from 28 pounds of butter per day to 25 pounds, and I have not yet been able to feed and pet them enough to recover it. Marketing is a very important point. We first used to trade butter for sugar at a store, pound for pound; but that did not pay. We have tried getting private customers at a stated price the year round, but found it unsatisfactory. When butter was higher they wanted all we had; when it was lower they did not want so much of ours. Have been most successful in shipping to a reliable commission house. Have been shipping to one house steadily every week for the past eight years; always shipped the same day of the week and the same butter; didn't make it the way we liked it, nor the way my wife liked it, but the way the customers liked it. We averaged 24 cents through the year. A farmer could make it pay with ten cows, but more would be better. Must make butter winter and summer, about the same quantity, and always the same quality. Results were only to be attained by hard work, close observation and persistent application."—*Exchange.*

DIVERSIFIED DAIRYING.

Cheese is the most nutritious of all foods: one pound is worth more than two of fresh meat. We would tire of round steak or of turkey and soon be disgusted with it if no other meat was furnished. So with cheese: one kind palls on the appetite. The French have more than 100 kinds, made to suit various tastes, and in small sizes for convenience of consumers; consequently the French use more cheese than meat. Americans will never become cheese-eaters until similar diversity is offered. A great mistake prevails in regard to ripening of cheese by which it acquires a peculiar flavor that pleases the majority of consumers, although many persons do not like it owing to an ungrounded fear of its unwholesomeness. This ripening process makes cheese more digestible and nutritious. The curing (refining, the French call it) develops fat in the cheese. A well-cured skim-milk cheese contains more digestible nutriment than a fresh whole-milk cheese. There is nothing unwholesome about it. The ferments by which cheese is mellowed or ripened are useful, not injurious. Who would eat a hard green pear in preference to one mellowed by ripeness? And this ripeness is due to ferments, able to change the hard indigestible tissues into sweet buttery pulp. It is much the same with the "refined" ripe cheeses made by French dairymen, some of which sell here for 50 cents to $1 per pound. This suggests opportunity for home gains by diversity of products. Two Wisconsin girls recently went to France to study the cheese business. Strange that no man had enterprise to do this years ago! Women led the way in fine butter-making, and will doubtless lead the men in fine cheese-making.—*A Pennsylvania Dairyman in Tribune.*

NEW YORK BUTTER SCHOOLS.

C. W. JENNINGS in Hoard's Dairyman.

At the Richford school, which was the best of the series, Prof. Roberts talked in his familiar way two hours the second day, during which he interested every one present so much that he was "given the floor," and directed to map out his own route and talk till he was ready to stop, which he did. He said:

We are here to study law. Animal law and physical law run parallel. There is a law for that burdock out there and for that potato, and there is one for that animal. The law we are here to study applies to dairy animals. I shall divide my subject into four parts. First,

INHERITANCE.

The animal, like the human, inherits looks, form, action, disposition, temperament, likes, dislikes, power, appetite and color. In my own family there are peculiarities that are traceable back five generations, and which careful training and study to avoid have not prevented. In some animals this law is very rigid, and in none more so than in the dairy cow. It is very necessary then that we should know what the true form of the dairy cow should be, and should study to reproduce, and if possible, more nearly perfect it. Badly shaped udders, horns, eyes and general form are inherited ofttimes. Look at a calf as you would at a picture. You will look at a picture an hour, but not two minutes at the calf. We must study law. I want these young ladies to go home, look at that old cow and ask her where she got those peculiarities, all of which are wrong. She may give very rich milk, and much of it, but it is quite probable her daughter never will. Constitutional vigor or weakness is also inherited. Seek the former and guard against the latter. Remember, the sire and dam must both possess health, vigor and vitality, and be able to transmit these essential characteristics to their progeny.

The second heading is

FOODS.

The horse has one small stomach, the cow has four large ones. Feed the horse often—four or five times a day. Feed the old cow when in the stable twice a day and give her all she will eat. She is a ruminant, and when her stomachs are full, will lie down, chew the cud, and secrete milk. Do not disturb her then. She must have a reserve force. I am an illustration of one who does not eat enough, because I cannot do it. I was not reared correctly. My mother did not know how to do it. She had not studied law. Result—no reserve force. Look at food from two standpoints. First, the chemical—that is the nutritive ratio—albuminoids, fat and carbohydrates. Second, the appetite. Make all foods appetizing for the animal as well as for yourself. Have you ever noticed the difference between two slices of bread, one cut two hours ago, and one just off the loaf? What's the matter with the former, now all dried up? Only the loss of a little water and a bit of aroma. The cow knows just as much about it as you do when she is offered foods that do not tempt her appetite. When you have thrown a forkful of hay on the floor, and allow all the moisture to be blown out by the wind, and the aroma to escape, it becomes unappetizing. Do not cut hay or remove it from the mow until you want to feed it. Ask the cow what she wants to eat and how she wants it served.

Look at her; she will tell you. Save the volatile oils in her food. When you uncover a basket of apples or grapes, the aroma from them fills the room. That is a principle nature puts into the fruit to make it more appetizing, tempting and easier digested. You do not find this aroma in fruits that have been doing duty as signs in front of a fruit stand or groceryman's door two or three days. Why are pies or sauce made of dried fruit so much less palatable and appetizing than when made from freshly picked or carefully preserved green apples? Why, the original moisture and aroma have gone, and what is more, cannot be returned and incorporated with the fruit as before. If I could, I would cover my hay-mows and replace the covers every time I feed my cows. Look closely to all these details. Feed the cows proper foods—which you will learn to do by making a study of their constituents—then give them all they need, but be careful not to over-feed them. When all is just right they will lie down and be happy. Again, let me say, make a careful study of the cow and her foods, and which you can do without the knowledge of much chemistry. Water is connected with foods. The engine is worthless without it. It takes everything into circulation and everything out of it, and life cannot exist without it. Therefore, see to it that the cow has all the pure, sweet water she wants, which to get properly, she must have free access to at all times.

The next head of my talk is:

ENVIRONMENT.

We all know what that means. With the cow it is the stanchion, the floor on which she stands; the yard in which she is turned; the stable in which she is kept; the impure or pure air she breathes, drafts of air, odors, filth, cleanliness, sweetness, restraint, contentment and comfort. Keep the air in the stables as pure as possible. It cannot be kept perfectly pure, as a part of the oxygen will have been burned out; but it may be kept comparatively pure by ventilation. Study to make the cow comfortable; give her a good bed to sleep on. I don't like to sleep on the rail of a bedstead. If my wife crowds me onto it, I go up stairs and sleep. If you can, have the barn-yard covered; the cows will then be kept warm and dry, and the manure unleached and free from water. I have seen men wearing rubber boots through mud and manure nearly to the top of them half a dozen times a day, between the barn yard and the kitchen, and never noticing it. Such dairymen complain that the "business don't pay." Environment, then, is the most nearly perfect surroundings for a cow. Notice it, think and read, store up and remember; then tabulate and practice. Improve your leisure moments. Catch up a book or paper, while waiting a few minutes for a meal, and thus improve the time to learn; such times are the odds and ends of work. Dr. Adams, while studying mathematics, learned history so well and thoroughly, and without spending any time but the odds and ends, that he became professor of it in the Michigan University, and subsequently president of Cornell university. Study Use the odds and ends, and make everything count. There is a difference between a straight and a curved line. The artist begins that way, and, bye and bye, produces the finished picture or statue. Little bits of things make the whole. Study them all and learn how to utilize them; then study environment.

The fourth heading is:

HABIT.

What does that mean? We have been doing a thing so long, in a certain wrong way, that we cannot stop it without making a tremendous effort. This habit is strong in dairying. Cows are over fed till they will eat too much and become gluttonous. Some cows inherit the habit, but most of them acquire it. Get the cow in the habit of starting toward her udder all she can get out of the food and drink you give her. Once started in that habit and she cannot help doing it any more than can the boy stop eating all the candy that is given him. If you milk her irregularly or not cleanly, she will soon begin to put the surplus behind her fore-shoulders, and it will be in the shape of animal, *not* milk-fat to be transferred to the pail. Get her into the habit of coming to the barn at milking hours, without the aid of a dog. Some bran placed in the feed-box will do it, and it is better for you and her. The University education is simply habit acquired. There is value in studying any one law, whether it be one surrounding a bird or a cow. Education in any one line tends to make us proud, no matter if it be not of the highest order. Get into the habit of making farming more of an intellectual pursuit and one of less drudgery. Study to do more with the head and less with the muscles. Be proud of your profession; it is the noblest ever followed by man. Start the boy right and he will acquire right habits. You may have to discipline him to force him to wash his hands before he goes in to dinner. Get him into the habit of doing it, and by and by he will be sure to do it. Get the cow into the habit of putting her food into milk instead of into horn. It will prove more profitable. Whenever you increase the growth of any organ above the normal condition, you do it at the expense of another. If the udder is enlarged, some other organ will be made less. You can so increase the udder and the milk-producing functions that all her other machinery will become enfeebled and impaired. A cow thus developed must have the best of environment, food and care, or she will fail to transmit her power to her offspring. If a man works ten or fifteen hours a day with his brain and none with his muscles, he will fail to rear healthy children. The average American family "runs out" in two generations. Now, don't "run out" the dairy cow. This disposition to force, and thus increase her milk and butter production, will, in time, work great injury to her. Be steady, thoughtful and careful, and don't spoil the Jersey, Holstein and other great breeds by forcing and pushing them too rapidly or far.

The habit of not knowing anything about what one cow produces, or what it costs to produce it, is everywhere present among dairymen, and one which it seems almost impossible to cure. I would as soon deposit $50 or $100 in a bank, week after week, never keeping any account of it, and knowing no account was kept at the bank, as to run a dairy without knowing how much every cow gave me, and how much cash it cost me to get it. This habit should be at once abandoned, because it is the most hurtful of them all in the dairy, and entails most loss. Weigh the milk from each cow, then test it for fat. Combine, a dozen of you farmers, and buy a Babcock machine, then test your cows. Any one with ordinary intelligence, good eye and a steady hand can do it, and once it is begun, the results will prove too valuable and interesting to abandon the practice.

If I look at a piece of silver or other coin, I can at once determine its value; but show me a pint of milk and I cannot tell you whether it is worth a cent or four of them. It may be white, yellow or blue, in color, and that is all I or any one else can tell about it. Only the test will tell; therefore test it. Abandon the bad habit and embrace the new one. Study law. It is all law in this world. If I break a moral law, I may repent; if it is a civil law which I break—by stealing a sheep or other property—if I have plenty of money and a sharp lawyer, I will stand a pretty good chance of keeping out of State prison; but, if I break or violate a law of agriculture, no power in earth or heaven will shield or help me. There is no use in going into the stable and praying to the Lord to cause the old cow to give more or better milk; it won't do, because He never will do it. There is a proper place in which to pray, and there are some things we may pray for, but more and better milk from a starved, scrub cow isn't one of them. Faith without work won't materialize. The Lord once said: "I give you dominion," but we have lost much of it since then. Let us regain it all by studying law.

Wisconsin, where the average yield of wheat was once twenty-eight bushels per acre, and which, by years of constant cropping the land to wheat, reduced the average to eight bushels, has, since the farmers abandoned wheat for the cow—only a few years since—increased the average yield to fourteen bushels, and the increase is constantly going on. Thus it will be seen that fertility there is being gradually restored through the influence of the cow, which is being fed largely from the silo. If it will lessen cost, increase fertility and make more and better milk in that State, it will do it wherever corn will grow and mature, and this portion of Franklin county, at least, is one of those favored places. With perfect corn silage more and better dairy products can be made in winter, and a larger and better fertilizing product—which is the farmer's bank, on which he can draw and always have his drafts honored—saved.—*Hoard's Dairyman.*

REFRIGERATOR TRANSPORTATION

FOR PERISHABLE FREIGHT.

In the discussions on dairying during the last series of Farmers' Institutes held by the Board of Agriculture, the question of how to get dairy products to market was one frequently referred to. Hon. S. C. Bassett, secretary of the Nebraska State Dairymen's Association, stated that the farmers of Missouri had access to distant markets through the refrigerator car system in a way that really gave them equal advantage with the dairymen near those markets, but who have to depend on express companies for short-distance hauls. In view of the importance of the matter to dairymen and other producers of perishable farm products, it was thought advisable to request one of the refrigerator companies operating in the State to make a statement concerning their business for publication in this report. The following is from the American Refrigerator Transit company, of St. Louis, Mo.

SECRETARY.

ST. LOUIS, MO., May 23, 1891.

LEVI CHUBBUCK, Esq., *Sec'y State Board of Agriculture :*

DEAR SIR—I am in receipt of yours of May 20, and it is with much pleasure that I reply to same:

Clause second of our charter reads as follows, and will advise you the business we are chartered to do:

The purposes for which this company or corporation is formed are to manufacture, purchase, hire, let, lease, have, own and operate cars for the transportation of what is known as perishable property, or perishable freight, merchandise or goods, between all points within the United States or the Dominion of Canada, and over and upon any and all lines of railroad with which it may contract for the transportation, forwarding or hauling of such cars, and the freight or property therein contained; and to that end, the company hereby created may contract,

> upon such terms as its board of directors may deem expedient, with any railroad company or companies, or with any persons owning or operating any railroad in the United States or in the Dominion of Canada, for the use of such cars, or the speedy transportation, forwarding and delivery of the cars aforesaid, and of all freight, property, merchandise and goods contained therein, at and between any and all points and places, either within the United States or the Dominion of Canada; and said corporation may buy, sell, own, lease, hire, contract for and have all such real or personal property as the nature of its said business may, from time to time, require.

The general organization is located at this point, and has freight agents and superintendents located in the various parts of the United States, as per statement herewith attached. Articles handled by us are covered by Mo. Pac. circular attached, marked exhibit "B."

The methods of this organization are the same in the freight service as the Pullman company in the passenger, namely: We supply rolling stock, repair shops, cold storage stations, ice stations, and agents to maintain the refrigeration while the cars are in operation. The railroads allow us for so furnishing cars and operating them, a certain mileage, generally ¾ of a cent to 1 cent, and a commission of from 5 to 12½%, according to the difficulties in transporting same.

We protect the railroad company against loss and damage through failure of refrigeration.

By referring to the annuals in your possession, you will find first-class cut of the car, showing how the ice bunkers are located, and the movement of the air.

The lines we operate over in Missouri are the Missouri Pacific and Wabash systems. Cars are cooled entirely by ice. Additional cost to the shipper ranges from April 1 to December 1, from $15 for vegetables and similar freight, and $50 to $75 per car for strawberries and other small fruits. Extra icing charge is made on dairy freight in car lots only. The less than car lots of dairy freight and other small-package freight is carried at the regular freight rate, on the basis that the additional charge for the less than car-lot package is sufficient compensation to the railroad line and refrigerator company.

In regard to time in transit, would say that we consider seven days from Kansas City, and five days from St. Louis, to New York, good time, although we often do better than that. We generally require five days from here to Galveston and San Antonio, and four days to Atlanta, one day to Chicago.

We handled last year something over 21,000 car loads of perishable freight, of which at least 7,000 or 8,000 was made up of broken lots made up through our pick-up cars and cooling-house system, of which the entire loss and damage to carriers amounted to only 10 cents per load, thus illustrating by practical demonstration that we now have this perishable business down to such a fine system that it can be handled with as much ease and with as little loss as the household goods and similar character of freight.

I hope that this will give you the desired information, and that you will not overlook the fact in your report that the American Refrigerator Transit company is the only organization supported by railroads that is doing exclusively perishable work, and is also the only company of this character that has her own exclusive car shops, and in addition to that, furnishing $75,000 worth of cooling-house facilities, located at Kansas City, St. Louis and Chicago, free to the patrons of this company, and that the headquarters of this organization is, and I hope always will be, in the city of St. Louis, State of Missouri.

Yours truly,

REID P. LATHROP, President.

BUSINESS DONE BY THE A. R. T. CO.

Average number of cars operated.	
1881 (8 months)	98 cars.
1882	297
1883	300
1884	309
1885	331
1886	357
1887	526
1888	797
1889	983
1890	1,167

Number of loads carried.	
1881 (8 months)	874 car-loads.
1882	3,666
1883	5,087
1884	5,599
1885	5,961
1886	6,781
1887	8,388
1888	14,173
1889	18,371
1890	21,032

Number of miles run by all cars in service.	
1881 (8 months)	1,054,186 miles.
1882	6,592,418
1883	6,744,368
1884	7,115,546
1885	7,504,170
1886	8,238,800
1887	11,281,771
1888	18,164,278
1889	24,422,351
1890	27,990,828

Actual number of tons carried by all cars in service.	
1881 (8 months)	8,758 tons.
1882	40,335
1883	60,099
1884	65,578
1885	64,480
1886	75,654
1887	104,701
1888	194,430
1889	310,681
1890	404,160

Amount expended in repairs.

1881 (8 months) ...	98 cars..	$191 52
1882................	297 " ..	3,666 81
1883................	300 " ..	20,511 68
1884................	309 " ..	24,756 06
1885................	331 " ..	23,399 35
1886................	357 " ..	26,633 11
1887................	526 " ..	34,159 01
1888................	797 " ..	45,978 84
1889................	983 " ..	84,099 84
1890................	1167 " ..	77,641 62

Ice consumed in the refrigeration of perishable property carried in A. R. T. cars.

1881 (8 months)...............		7,820 52
1882..........................		28,719 68
1883............	2,871 tons..	22,146 81
1884............	3,482 " ..	17,749 05
1885............	3,854 " ..	16,773 16
1886............	4,898 tons..	19,898 99
1887............	5,487 " ..	19,483 73
1888............	8,717 " ..	21,834 92
1889............	11,881 " ..	42,767 13
1890............	13,162 " ..	67,775 00

Loss and damages.

1881 (8 months) on 374 loads, or 27 cents per load..................					$232 60
1882 on 3,666 loads, or 40c per l'd,					1,549 85
1883	5,087	"	59c	"	2,996 74
1884	5,599	"	31c	"	1,164 68
1885	5,961	"	12c	"	686 32
1886	6,781	"	6c	"	410 31
1887	8,388	"	11c	"	893 94
1888	14,173	"	18c	"	2,570 33
1889	18,371	"	8c	"	1,428 84
1890	21,032	"	11c	"	2,396 22

ARTICLES HANDLED BY THE A. R. T. COMPANY.

Ale, beer and porter........
Apples, evaporated........
Berries, fresh..............
Bacon and ham.............
Beef or pork, fresh.........
Bread, liquid...............
Butter.......................
Butterine...................
Cabbage....................
Cider........................
Cheese.....................
Cranberries.................
Eggs........................
Fish, fresh..................
Fruit, green (apples, peaches, pears, etc.).....
Fruit, tropical (bananas, oranges, lemons, pine-apples, cocoanuts, etc.).....
Fruit, tropical and green, and vegetables, mixed...
Game......................
Ice..........................
Kraut......................
Lard........................
Malt, extract..............
Meat, sausage, fresh .....
Meat, green or fresh, salted.....................
Melons.....................
Mineral water.............
Mince-meat...............
Oleomargarine ....
Onions.....................
Oysters, fresh.............
Oyster meat...............
Pigs' feet, fresh.........
Pork or beef, fresh, dressed
Potatoes ....
Poultry, dressed..........
Sauer-kraut...............
Tallow.....................
Turnips....................
Vegetables, green, N. O. S.
Vegetables, green and tropical fruit, mixed... .

MISSOURI TROTTING AND PACING HORSE BREEDERS' ASSOCIATION.

FOURTH ANNUAL MEETING.

LEVI CHUBBUCK, *Secretary State Board of Agriculture:*

In compliance with instructions, I submit the following report of the fourth annual meeting of the Missouri Trotting and Pacing Horse Breeders' Association, together with constitution and by-laws:

The fourth annual business meeting of the Missouri Trotting and Pacing Horse Breeders' Association met at Mexico, Mo., December 30, 1890, a quorum being present, Hon. Norman J. Colman, President, in the chair. The minutes of the last meeting were read and approved.

J. A. Glandon offered the following resolution, which was unanimously adopted, to wit:

Resolved, That we hereby request the publisher of Colman's Rural World to continue to serve the Trotting and Pacing Horse Breeders' Association of Missouri as its representative paper, and that we pledge ourselves to support it to the extent of our ability by aiding it in the collection and dissemination of information respecting the horses and horsemen of the State, and thus keep the members of the Association familiar with what is being done by every other member.

S. T. McCormick of St. Louis offered the following, which was adopted:

Resolved, That it is the sense of this Association that the executive committee thereof be authorized and empowered to appoint a committee of three of its members to communicate with the officers of the several associations of the different States, with the view to organizing a national association, composed of from three to five members, chosen from the associations of the several States—such national association to meet once a year to enact laws for its government, and of the several different State associations.

The President appointed T. E. Spencer, C. F. Clark, H. J. McCormick and H. C. Tindall as a committtee to inquire into the feasibility and advisability of perfecting arrangements for constructing a kite-shaped track, if thought necessary, and to receive bids from the different towns of Missouri for the location of the same, to report at the next meeting.

H. J. McCormick offered the following amendment to section 4, article 6, of the constitution, which was adopted by a two-thirds vote of the members present, to wit:

To amend section 4, article 6, of the constitution, by striking out after the figures "10," in said section, the words "when there are four starters, and $65 and $35 when there are less," and inserting in their stead the words "per cent of the entrance money."

The finance committee made their report on the reports submitted to them by the Secretary and Treasurer, which was adopted and approved.

It was ordered that the Secretary procure a suitable book in which to keep a record of the races at the race-meetings of this Association.

On motion of C. F. Clark, it was ordered that a committee of three be appointed to confer with the State Board of Agriculture and the railroad commissioners of the State, with the view of obtaining better terms and rates for shipping the horses of members of this Association over the various railroad lines of this State, and the following persons were appointed as such committee, to wit: George Longman, C. F. Clark and R. Todhunter.

It was also ordered that the Secretary of this Association furnish the State Board of Agriculture a report of the proceedings of the meetings of this Association.

The following were elected members of the Executive committee for a term of three years: L. P. Muir, of Independence, Mo.; W. R. Carter, of St. Louis, Mo.; J. C. Quarles, of St. Joseph, Mo.; B. P. Finley, of Huntington, Mo.; E. D. Foote, of Memphis, Mo.

On motion of Col. L. P. Muir, Messrs. Clark & Potts, of Mexico, Mo., were selected to hold and conduct the annual sale of this Association, at Mexico, Mo., for the year 1892.

A motion duly seconded, that this Association hold its next annual business meeting at Mexico, Mo., on the second Tuesday in December, 1891, was put to a vote and carried.

It was voted that the thanks of the meeting be tendered to the citizens of Mexico, for the kind and hospitable manner in which they had entertained the members of the Association during the present meeting, after which the meeting adjourned.

MEETING OF THE EXECUTIVE COMMITTEE.

The Executive committee of the Missouri Trotting and Pacing Horse Breeders' Association met at Mexico, Mo., December 30, 1890, there being fourteen members present. The following proceedings were had:

The following officers were elected for the ensuing year ·

President, Norman J. Colman, St. Louis; First Vice-President, John Cline, Rensselaer; Second Vice-President, L. P. Muir, Independence; Third Vice-President, John C. Quarles, St. Joseph; Secretary, H. C. Tindall, Fayette; Treasurer, B. P. Finley, Huntington; Starter, Clem. Creveling, St. Louis.

On motion of C. F. Clark, it was voted that the thanks of the committee be extended to Mr. L. E. Clement, ex-Secretary, for the good work that he has performed for the Breeders' Association while acting as Secretary of the same.

The President called for bids for holding the annual race-meeting for 1891, and none being offered, Mr. C. F. Clark, on behalf of the Audrain County Fair Association, offer the State Breeders' Association the use of the grounds at Mexico, with all the privileges pertaining to the same, for the purpose of holding the race-meeting, free of charge.

After discussing this and other propositions, a motion to postpone action on this matter for one month, being put to a vote, was lost.

A motion to accept the proposition of the Audrain County Fair Association, as made through Mr. Clark, was submitted to a vote and carried.

Mr. Cline moved to reconsider the vote by which the proposition of Mr. Clark had been accepted, which motion was voted on and carried.

A motion to defer action on selecting the place of holding the next race-meeting until the fourth day of February, 1891, and authorizing the President to receive bids for the same, was carried.

It was ordered that a warrant be drawn on the Treasurer for $55.30 in favor of H. C. Tindall, ex-Treasurer, on account of payments made by the ex-Treasurer in excess of receipts.

The President appointed the following named persons as a committee to confer with Breeders' Associations of other States in regard to organizing a National Association, to wit: S. T. McCormick, St. Louis; H. C. Tindall, Fayette; J. A. Glandon, Mexico; B. P. Finley, Huntington; Clem. Creveling, St. Louis. A motion to add the name of the President, Gov. Norman J. Colman, to the committee, was carried.

The following committee was selected to confer with the horse breeders of Illinois, with a view of holding a race-meeting at St. Louis, Mo., under the auspices of the breeders of Missouri and Illinois, to wit: Rolla Wells, S. T. McCormick and R. C. Pate. The committee adjourned to meet at Mexico, Mo., February 4, 1891.

H. C. TINDALL, Secretary.

CONSTITUTION, BY-LAWS AND RULES.

ARTICLE I.

Sec. 1. This association is formed to advance the legitimate interests of the breeders of the trotting and pacing horse in Missouri.

NAME.

Sec. 2. Its name shall be The Missouri Trotting and Pacing Horse Breeders' Association.

ARTICLE II.

Sec. 1. The officers of this association shall consist of an Executive committee of fifteen members, a President, three Vice-Presidents, a Secretary and a Treasurer.

Sec. 2. These members of the Executive Committee shall be chosen at the annual meeting of the Association, and shall hold office until their successors are duly elected. The Executive committee is divided into three equal classes, and the term of office of the oldest class shall expire on the last Thursday in December in each year. All officers of this Association shall be chosen by ballot.

Sec. 3. Members to replace the outgoing class, and to fill vacancies in the other class, shall be elected by the Association at the annual meeting.

Sec. 4. A majority of all the votes cast shall be necessary to the election of a member of the Executive committee, either to a place in the incoming class, or to fill a vacancy in either of the other classes.

Sec. 5. The Executive committee is authorized to elect annually a President, three Vice-Presidents, a Secretary and a Treasurer, who shall hold office until the last Thursday of December of each year, or until their successors are elected.

Sec. 6. The President shall preside at all meetings of the Association, and of the Executive committee, and shall be the chief executive officer of the same.

Sec. 7. The Vice-Presidents shall preside in the absence of the President, and act as President in case of his death, resignation or refusal to serve.

Sec. 8. The Secretary shall keep the minutes and records of the Association, conduct its correspondence, and perform such other duties as may be required of him by the President or the Executive committee.

Sec. 9. The Treasurer shall have the custody of all the funds of the Association, collect all dues, and pay out same on the order of the President. He shall make a report annually to the Association.

Sec. 10. The Executive committee shall have full charge and control of the affairs of the Association. It shall meet on call of the President, or on the call of three (3) members of said committee in writing. Five shall constitute a quorum. It shall make a report, at the annual meeting, of its proceedings.

Sec. 11. Sub-committees to be appointed by the President and Executive committee, either from their own body, or from the members at large, and vacancies in such sub-committees to be filled by the remaining members of said committee.

ARTICLE III.

Sec. 1. The Association shall meet annually at such time and place as the Executive committee may select.

Sec. 2. Special meetings may be called at any time by the President, on public notice of fourteen (14) days.

ARTICLE IV.

MEMBERSHIP AND DUES.

SEC. 1. All breeders and those interested in the trotting horse are eligible to membership in the Association, if approved by the Executive committee, who shall take into consideration the character and standing of the applicant.

SEC. 2. Applications for membership must be proposed in writing by at least two members.

SEC. 3. Those persons signing this constitution at the meeting when it is adopted shall be members of this Association, on payment of an initiation fee of two dollars.

SEC. 4. Thereafter all members shall be elected by the Executive committee by ballot. Four negative votes shall reject an applicant.

SEC. 5. The dues of members of this Association shall be two dollars each year, payable in advance.

SEC. 6. Any member remaining in arrears for dues more than three months, after demand by the treasurer, may be dropped from the roll of members by the Executive committee.

ARTICLE V.

DISCIPLINE.

SEC. 1. The executive committee shall have power to censure, suspend or expel any member of this Association for just cause, by a two-thirds vote of the members present, a copy of the charges having been first furnished to the accused, with an opportunity of being heard in his defense.

SEC. 2. Any member considering himself aggrieved by such action may appeal to the Association, when the proceedings shall be reviewed, and a majority vote may affirm or reverse the action of the Executive committee, and said expulsion, confirmed by the Association, is forever ineligible for membership in this Association.

ARTICLE VI.

TROTTING MEETINGS.

SEC. 1. At least one general meeting shall be held under the auspices of this Association in each year, at such date and place as shall be announced by the Executive committee—entries to be confined to geldings of five years old or under, and to mares and stallions of any age, owned or raised in Missouri by members of this Association; or stallions, or the get of stallions, owned or stood by members. (Provided said ownership is bona fide for one year previous to making entry.) In all colt stakes, or where the question of breeding is an issue, ownership of the mare at the time of foaling by a member of this Association, no matter where she may be, shall constitute such colt Missouri, bred for all the purposes of this Association.

SEC. 2. Entries shall be made in such classes and on such terms as shall be determined and announced by the executive committee.

SEC. 3. Each owner of a horse that starts in mile heats may, at his request have a separate timer, and if the horse beats 2:30 the Association shall pay him $10 for such performance.

SEC. 4. The total entry money to be divided into four moneys, which shall constitute the stakes, as follows: $50, $25, $15 and $10 when there are four starters, and $65 and $35 when there are less; when but one horse appears at the post for a walk-over, he shall be awarded the full amount of the stakes and one half of the added money—the other one-half of the added money reverting to the Association. A horse distancing the field shall only be entitled to so much of the money as the starters in the race could have won.

SEC. 5. All matters of detail in relation to such meetings to be settled by the Executive committee, of which timely announcement shall be made through the Rural World.

SEC. 6. The Executive committee shall frame such by-laws for its own government and for the government of the Association as are, in their judgment, for the best interests of the Association, not inconsistent with this constitution.

ARTICLE VII.

QUORUM.

SEC. 1. It shall require ten members of the Association present to constitute a quorum at each and every meeting of this association. Votes by proxy shall not be received.

ARTICLE VIII.

AMENDMENT.

SEC. 1. This Constitution may be abrogated, altered or amended at any annual meeting by a two-thirds vote of the members present, or at any special meeting called for the purpose, if stated in the call of the special meeting.

The foregoing Constitution having been adopted this day, we hereby sign the same this 12th day of January, at the court-house at Sedalia, Mo.

BY-LAWS.

I.

MEETINGS.

SEC. 1. Special meetings of the executive committee shall be called by the secretary on the order of the president, or on request of any two of its members, by written or telegraphic notice of at least six days.

II.

ANNUAL MEETING AND ELECTION.

SEC. 1. Every member, when present, shall be entitled to one vote at all meetings of the Association.

SEC. 2. A majority of all votes cast at any election shall be necessary for the choice of an officer.

III.

BOARD OF CENSORS.

SEC. 1. The actions and proceedings of the board of censors shall at all times be subject to the review and control of the executive committee and of the Association.

IV.

DUTIES OF TREASURER.

SEC. 1. The treasurer shall receive all moneys belonging to the Association.

SEC. 2. All moneys paid by the Association shall be drawn upon the check of the treasurer, countersigned by the president or vice-president.

SEC. 3. The treasurer shall be required to give a bond, approved by a committee of two, appointed by the president from the executive committee, in the sum of two thousand dollars ($2,000) (or such other sum as may seem necessary), for the faithful discharge of his duties.

V.

FINAL PAYMENTS IN STAKES.

SEC. 1. The money paid on entries in any of the stakes opened by this Association wherein all the nominators fail to make final payments shall be regarded as forfeited to the treasury of the Association.

VI.

SEC. 1. A badge shall be prepared by the treasurer for each member, to be worn at all trotting meetings, and a pass furnished those members who have full-paid entries to such meeting, and are not in arrears for dues.

VII.

SEC. 1. Any collusion, or bargain to divide, change or in any way alter the results of a stake-race, either to change the record made or the proportion of the stake made, shall be reported to the officers of the Association, and the executive committee shall investigate, and if any such collusion or bargain shall be proven, all parties so convicted of such collusion to alter or change the results of such race shall forfeit to the Association all their interest in such stakes; and on a second bargain being proven, such party or parties shall forever be expelled from the Association. A request made to another member not to distance a colt nominated, or to the judges to call faster or slower time than that actually made, shall be sufficient for forfeiture.

VIII.

All races of this Association shall be under the rules of the American association.

IX.

EXHIBITION OF STOCK.

SEC. 1. That it shall be the privilege of any member to exhibit his stock at the annual trotting meeting of the Association, upon giving to the secretary thirty days' notice prior to the meeting, of such exhibition, and it shall take place at such time as the executive committee shall designate, and shall be under its control.

X.

ORDER OF BUSINESS.

1. Calling the roll.
2. Reading minutes of preceding meeting.
3. Report of treasurer and secretary.

4. Reports of committees.
5. Motions and resolutions.
6. Unfinished business.
7. New business.
8. Nomination and election of officers.
9. Miscellaneous business.

MEMBERS OF THE ASSOCIATION.

H. V. Worley	Peirce City
W. R. Carter	St. Louis
D. W. Hunter	Westport
J. Q. Thompson	Walker
W. A. McNulty	Sedalia
Dell Barker	Greenwood
B. F. Holway	Sedalia
J. M. Hunningway	Kansas City
S M. Finley	LaGrange
Fred. Wallace	Lebanon
F. J. Grigsby	Maryville
George Longman	St. Louis
J. F. Gilbirds	"
Leo Moser	"
W. N. Tivy	"
J. R. Rippey	Glenwood
Elijah Hawkins	Hannibal
J. M. Nickell	"
J. M. Irle	Kirksville
T. E. Graves	"
S. Jonas	"
D. L Bourne	La Belle
H. C. Ewalt	"
T. H. Hunter	Westport
James C. Smith	Caledonia
George F. Mullen	Hannibal
John W. Rowe	Charleston
T. B. Rice	"
W. W. Finley & Son	Huntington
Reed Bros	Green Ridge
Loundes H. Davis	Jackson
P. M. Cox, Jr	Osceola
Collins J. Johnson	Palmyra
Clarence Jackson	"
James Longshore	Belton
J. H. Story, M. D	Clarksville
Norman J. Colman	St. Louis
L E. Clement	Peirce City
Charles E. Wadleigh	Green Ridge
John Cline	Rensselaer
J. G. Callison	Windsor
R. C. Risk, M. D	Williamstown
L. D. Buttles	Memphis
R. F. Buller	Carthage
S. M. Hood	Sarcoxie
Alfred Beirs	St. Louis
S. A. Lee	Greenwood
S. A. Mertzer	"
Ridenour & Son	"
Richard L. Cummings	Palmyra
John Beckerly	Monett
J. C. Leach	Memphis
H. D. Ayers	Breckenridge
Michael See	New Florence
McCormick L. S. Co	Bowling Green
W. N. Gibbs	"
A. M. Harrison	Mexico
R. E. Hisey	"
J. N. Luckie	"
S. E. Kendall	"
J. R Baker	"
Joseph P. Landes	Osceola
Thomas Amrine	"
J. W. Bullard	Memphis
Roadster Breeding Co	Memphis
W. T. Birney	Oakwood
George H. Ross	Labadie
John M. Ginus	Clarksville
Will H. Pfaff	Green Ridge
L. E. Lancaster	"
H. C. Tindall	Fayette
Ezra Overall	"
Wood Madox	Mexico
C. F. Clark	"
J. A. Potts	"
J. A. Glandon	"
John E. Hinman	Centralia
Green Clay	Mexico
R. M. White	"
Joseph Henderson	(?)
B Gutherie	Hatton
Dick Smith	Fulton
W. H. Smith	Palmyra
Dr. J. M. McComas	Sturgeon
J. M. Leet	Maryville
J. C. Quarles	St. Joseph
Hurxthals Sons	Chillicothe
Jacob Morris	Trenton
I. Hulderman	Chillicothe
J. S. McNally	"
Thomas Burgess	"
James E. Robertson	Renselaer

MEMBERS OF THE ASSOCIATION—Continued.

George B. Burnett	Palmyra
W. P. Hawkins	Bowling Green
A. W. McAllester	Columbia
H. K. Allen	Deer Park
Overall & Morrison	Fayette
Wm. Crumley	Belton
Frank Huber	"
R. T. Christian	Renick
Joseph Wood	Moberly
H. H. Wayland	"
B. R. White	"
E. W. Stephens	Sedalia
Maj W. Gentry	"
Samuel Fuller	"
Samuel Gillman	"
A. Farnham	"
T. E. White	"
J. S Hughes	"
J. D. Barrett	"
E. C. Gibson	"
Wm. E. Smith	"
W. C. Worman	"
Fred Teubner	"
John Whitset	"
W. F. Finley	Rensselaer
John R. Gentry	Hughsville
Joseph R. Barnett	Lexington
Capt. R. Todhunter	Dover
L. P. Muir	Independence
W. M. Dills	"
J. F. Robinson	Windsor
C. Brinkerhardt	"
Dr. T. G. Shadburn	"
L. A. Chapman	Peirce City
W. G. Cochran	Kirksville
Joseph D. Lucas	St. Louis
Edward Martin	"
W. T. Dobins	Shelbina
J. H. Fox	"
E. W. Worland	"
A. F. Wychoff	Appleton City
E. B. Ensor	Savannah
J. A. Alger	Kirksville
C. F. Wright & Bro	Springfield
Dr. Geo C. Pitzer	St. Louis
L. P. Marx	Webb City
J. C Columbia	"
J. G. Troutman	Boxford
W. F. Haspel	St. Joseph
Dr. A. J. Buckner	Peakville
J. C. McIntyre	Fulton
Joseph Pratt	Mexico
Charles H. Pearce	St. Louis
J. A. J. Schultz	St. Louis
August Berthold	"
W. W. Andrews	Maryville
W. W. Jackson	"
J. L. Scott	"
Thomas B. Price	Sweet Springs
George Dyer	Slater
R. A. Potts	Mexico
E. R. Cunningham	"
John Fields	"
J. B. Liggitt	Palmyra
W. S Gilchrist	Springfield
I. M. Halstead	Breckenridge
C. D. Colman	St. Louis
Grant Tilden	"
Thomas Tilden	Syracuse
J. K. Sublett	Golden City
Charles J. Chappell	Windsor
J. P. Brimfield	Sturgeon
C. B. Parsons	Bonne Terre
R. L. McDonald	St. Joseph
T. C. Roberts	"
J. T. Davidson	Hannibal
G. B. Blanchard	Marshall
John Donovan, Jr	St. Joseph
D. M Roper	Reeds
E. P. Maggard & Co	Peirce City
C. C. O'Fallon	Pevely
Charles Miller	Sedalia
Wm. M. Peck	Mt. Vernon
George L. Chrisman	Independence
L. O. Swope	"
J. S. Dicus	Fulton
Aleck Frazier	Kansas City
Milton Ervin	Oronogo
Wm. C. Creveling	St. Louis
Col. D. S. Harris	Ashland
J. W. Barnhill	Marshall
Walter B. Waddill	Lexington
T. E. Spencer	Marshall
H. H. Westmoreland	Springfield
Col. H. F. Fellows	"
H. C. Creveling	St. Louis
H. A. Hammel	"
Jas. G. Creveling	Clayton
I. P. Adams	Jefferson City
Geo. W. McCann	Springfield
H. S. Bennett	"
J. E. Hall	Lexington
E. S. Secott	Moberly
M. Beamer	Blackburn
H. C. Fox	Springfield
James Miller	Springfield

MEMBERS OF THE ASSOCIATION—Continued.

H. J. McCormick	Bowling Green
S. T. McCormick	St. Louis
J. T. Donovan	“
Geo. Gray	“
J. H. Howard	Fulton
W. H. Hatch	Hannibal
B. F. Swaggard	Sweet Springs
Dr. E. J. Geisinger	Unionville
C. H. Nelligan	Marshall
Dr. W. H. Black	Rich Hill
R. W. Kum	Lexington
G. W. Patterson	Republic
W. Geo. W McKinley	Savannah
Colman & Fishback	Columbus
W. H. Glenn	Bowling Green
Joseph C. Downing	“
L. Spilbring	St. Louis
Thos. Turner, V. S	Mexico
T. W. Brandt & Son	Montgomery City
T. J. Norfleet	Mayview
James T. Jones	Warrenton
C. C. Booth	Shackleford
W. R. Sanford	O'Fallon
A. B. Crawford	Springfield
J. R. Baker	Mexico
John Fitzgibbon	Marshall
Alfred F. Rector	“
M. Anderson	“
J. W. Robertson	“
T. M. Smith	St. Joseph
J. F. Davidson	Hannibal
C. M. Cline	Oakwood
James E. Letterell	Belton
C. Logsdon	Blackburn
T. Van Studdiford	Jonesburg
T. B. Branstetter	Vandalia
Dr. J. C. Parish	“
T. S. Gordon	Columbia
Dr. G. W. Bates	Bates City
Foote Bros	Memphis
J. M. Myers	“
John A. Wendil	St. Louis
J. C. Mills	Lancaster
Rush Elmore	Westport
Ed. Forsyth	Maryville
F. G. Shoemaker	“
R. F. Lakenan	Kansas City
B. Losen	“
S. R. Harris	Stanberry
J. W. Shrader	St. Joseph
Hon. Norman Gibbs	Mt. Vernon
R. L. Bowles	Palmyra
J. B. Duval	Dockery
Carroll Bros	Clarksville
N. A. More	Huntington
J. & F. J. Burrus	Miami
G. N. Jackson	“
R. W. Cunningham	Kansas City
Patterson Stewart	“
John Hughes	“
Geo. O. Kick	“
Charles Lockridge	“
John R. Potts	Marshall
Geo. C. Wright	St. Louis
A. M. Harris	Mexico
Henry Wood	Bowling Green
J D. Eubank	Fayette
R F. Freeman	Mexico
T. A. McIntyre	“
J. T. Johnson	“
T. S. French	“
Lee Wright	“
E. B. Norris	“
J. W. McKinley	St. Joseph
R. K. Thompson & Son	Slater
J. M. Wilson	Bowling Green
W. C. Prewitt	Clarksville
Frank C. Reilley	St. Louis
L. C. Dingman	“
A. C. Bowman	Mexico
George Robertson	“
Wm. Lewellen	“
Thomas Lafon	Columbia
R E Biggs	Farber
J. R. Fant	Carthage
Charles T. Donovan	Maitland
Saunders & Biddlecome	Peirce City
Dr. Wm. Johnson	Grant City
R. W. Napier & Co	Hamilton
John Northern	Mexico
P. Dudley	“
M. L. Jones	“
P. W. Dingman	“
L. W. Morris	“
G. L. Ferris	“
A. G. Turner	“
A. G. Houston	“
F. Coatsworth	“
J. W. Dowell	“
C. R. Gibbs	“
R. M. White	“
J. T. Griffin	“
G. D. Farris	“

STANDARD-BRED HORSES IN MISSOURI.

EDITOR RURAL WORLD: You will remember the circular issued from this office some months ago, and published in your columns, requesting owners of standard-bred horses in Missouri to forward me the names and number of registered stock owned. A copy of the circular was sent to all the members of the Missouri Trotting and Pacing Horse Breeders' Association. The purpose in doing this was to determine to what extent Missouri is supplied with standard-bred stock. The replies were placed in the hands of Mr. Thos. Lafon, who is familiar with the horse interests of the State, and well versed in horse literature, for compilation. The data he has prepared will be published in the annual Report of the Board of Agriculture, which will go to press now very soon, so I send the article to you for publication, if you desire, so that additions and corrections may be made previous to its insertion in the report. As Mr. Lafon says, the number given must be far from complete, for many horsemen failed to respond to the request. We hope that those who know of any standard-bred horses in the State, not mentioned, will put this office in possession of the facts so that the list may be complete.

Respectfully,

LEVI CHUBBUCK,

Sec'y State Board of Agriculture, Columbia, Mo.

The following is Mr. Lafon's paper:

In the winter of 1880-91, the Secretary of the State Board of Agriculture sent a circular letter to each member of the Missouri Trotting and Pacing Horse Breeders' Association, and others known to be interested in the industry of producing harness horses, requesting them to send him a list of the standard stock owned in their several sections. The following is the result:

Property of D. L. Bourne, LaBelle, St. Valentine 10232, Lubins, 10080, Patenter 10081, Knaphide 11755, Stetson 11195, Jewell, 11194, Konwc, Sprocket; 26 mares and fillies.

Richlawn Farm, Greenwood, Treasure 3499, Macedonin 523, Baron West 9279, Avesti 13613, Garton 13850; 17 mares and fillies.

Locust Grove Farm, Hughesville, Winston 9980, Bartholdi 3782, John R. Gentry 12645.

McCormick Live Stock Co., Bowling Green, Grampian 9131, Aytoun 14083, Buford 10782, Cigar 12722, Black Norris, Guarantee, Ashley, Jersey, Tokio, Romone, Highfive, Canton, Ramsay; 23 mares and fillies.

T. H. Hunter, Westport, John B. 6703, Mecoa 3660, Murphy 3668; 2 mares.

Spring Lawn Stock Farm, Springfield, Trumpeter 1848, Irie E. 9790; about 20 head of mares and fillies.

J. R. Rippey, Arlington Stock Farm, Glenwood, Grenadier 535, Walter C. 14060, Royal Clay 1680, John R. ——, Woodlawn ——; 16 mares and fillies.

M. Beamer, Blackburn, Mo., Saline 14375, Al West 14371, Beamer 14953, President Wilkes 14372, Lee Steel 14951, Steel 6241, Dick Davis 14374, Geo Vest 14376, Dr. Bridges 14372, 8 mares and fillies.

Colman Stock Farm, St. Louis, Mo , has the following stallions: Monitor 1327, Monitor Prince 4692, Monitor Wilkes 4693, Monophone 10281, Prince Rene 10607, Monitor King 10608, Montroy 10609, Monson 10611, Monocrat 10612. Besides these there are a number of standard-bred colts not yet registered. There are forty standard-bred mares registered and subject to registration.

H. C. Tindall, Fayette, King Herod 14183, Newton Elliott ——, Os Barton ——, 2 mares.

J. C. Callison, Windsor, Walnut Boy 8018, Medley 7575, Noble C. 13168, 6 mares and fillies.

Ed. Forsyth, Maryville, Patchen Mambrino 11825, Geo. W. Teed 11767, Tattler Boy 11053, Alleghany Boy 3401, Herschel 3524, Wilkiemont 5988, Normandy Boy 10362, Guy 12796, Jove 3758, Frank Rysdyk 12806, Jim Prather 6478, King Miller 6477.

John Cline & Sons, Rensselaer, Midas 2663, Cashman 1061, El Capitan 9950, Allenton 11315, Gov. Palmer 11313, 29 mares and fillies.

Foote Bros., Mexico, Prince Medium 2156, Dr. Strong 10776, 4 mares and fillies.

J. A. J. Shultz, Lexington, Wilkomont 2734, Almont Pilot, Jr.

B. F. Swaggard, Sweet Springs, Andrew Allison 6022, Osman 1403, Star of Saline 12656, Laddie 12604, 5 mares.

W. W. Finley & Son, Huntington, Valcour 4450, Princemont ——, Neville ——, Widman ——, W. J. Lewis ——, 6 mares and fillies.

King Hill Stock Farm, St. Joseph, Wilkie Russell 6350, Ashmore 6351, Nutwood Russell ——, Wilkie Startle ——, Simoom ——, 5 mares and fillies.

Joel Q. Thomson, Walker, Principality 6009, Beware 8697, Almont Rattler 500, Collateral 14313, Trusty ——, 5 mares and fillies.

Dr. Pitzer, St. Louis, Arsaces 6506, Poneto 12389, Cleotus 7257.

Carroll Bros., Clarksville, Receiver 11375, Bulgaria 11338.

W. W. Jackson, Maryville, Hatton Boy 13060, Alleghany Boy 3401.

J. M. Myers, Memphis, Konantz 6491, Prince Medium 2156.

S. M. Finley, La Grange, Abdallah Belmont 6244, Diamond Egg 11970, 5 mares and fillies.

D. B. Guthrie, Hatton, Red Jim 13615, Monoboy 13270.

R. K. Thompson, Slater, Crayon 13989, Larrable 7834, 6 mares and fillies.

S. A. Mentzer, Green Ridge, Joe Elmo 3450, Artistic ——, 6 mares and fillies.

H. D. Ayers, Breckenridge, Calm 9256, 5 mares and fillies.

Simon R. Harris, Stanberry, Combination 10023, 4 mares and fillies.

E. J Geisinger, Unionville, Ovid 4015, 2 mares.

James L. Brasfield, Unionville, Mike Bowerman 9957, one mare.

T. C. Roberts, St. Joseph, Lem 2992, 2 mares.

R. C. Risk, M. D., Williamstown, Forsee 6524, one filly.

W M. Dills, Kansas City, Governor Wilkes 6513, 2 mares.

John E. Hinman, Centralia, Indian Boy 9236, 6 mares and fillies.

Hombs & Guinan, Euland, 3 mares and fillies.

Hays & Dysart, Woodruff, one filly.

Rich Wilson 4777, owned by C. F. Wright & Bro., Springfield.

Brazenfield 11324, owned by F. C. Reilly, St. Louis.

Payne Killer 5920, owned by J. C. Bauer & Son, Bethel.

Joe Blackburn 6878, owned by J. & J. F. Burruss, Miami.
Alar Clay 706, owned by J. S. Dicus, Fulton.
Charles Reade 8246, owned by Thos. Lafon, Columbia.
Von Dallah 8927, owned by J. G. Troutman, Boxford.
Prince Ali 1455, owned by T. S. Gordon, Columbia.
Keno 14776, owned by J. Beekerly, Monett.
Lotion 11757, owned by Homer Smith, Kirksville.
Nassau 9347, owned by C. E. Darrow, Kirksville.
Rowland 9623, owned by R. W. Napier, Hamilton.
Atlas 11987, owned by B. Losen, Kansas City.
Glamour 9638, owned by ——.
Strathan 2169, owned by ——.
Star Wilkes 3629, owned by Fraser & Welsh, Pleasant Hill.
Mambrino Pilot, owned by Dr. W. A. Tichenor, Fulton.
Luke Brodhead, owned by ——.
Messler 8410, owned by G. W. McKinley, Belton.
John Deer, ——, owned by C. A. Stafford, Kahoka.
Kentucky Idol 9760, owned by ——.
Milroy 12804, owned by ——.
Misdeal 14496, owned by ——.
Java 9677, owned by — —.
Buller 4944, owned by Norman Gibbs, Mt. Vernon.
Monitor Temple 10690, owned by Wilder Bros., Mt. Vernon.
Coramont 11930, owned by L. E. Clement, Peirce City.
Harvester 3648, owned by L. E. Clement, Peirce City.
Resumption 6277, owned by L. E. Clement, Peirce City.
Gilbirds' Sprague 2715, owned by A. B. Gilbirds, Springfield, Mo.
Rose Hill 6377, owned by A. B. Gilbirds, Springfield.
Silver Moon 10691, owned by ——.
Nee Bau 3912, owned by ——.
The Poet 9168, owned by ——.

STANDARD MARES.

Elijah Hawkins, Hannibal, has two standard mares.
W. H. Hatch, Hannibal, has five standard mares.
L. P. Muir, Independence, has two standard mares.
S. A. Wright, Springfield, has one standard mare.
W. E. White, Williamstown, has three standard mares.
A. W. Selway, Williamstown, has one standard mare.
————, Springfield, has two standard mares.
Arnold Bros., Lewistown, has two standard mares.
Jos. Bowles, La Belle, has one standard mare.
E. C. Ewalt, La Belle, has two standard mares.
G. H. Kendrick, La Belle, has two standard mares.
Dr. McKim, La Belle, has one standard mare.
Frisby McCullough, Edina, has one standard mare.
W. C. Bradshaw, Canton, has several standard mares.
J. H. Cox, La Grange, has one or two standard mares.
Ed. Bradshaw, La Grange, has two standard mares.
L. H. Hayes, Ashton, has one standard mare.
J. W. McDermitt, Kahoka, has two standard mares.

J. A. Ross, Stanberry, has four standard mares.
Wm. Kendrick, Newark, has one standard mare.
A. G. Dod, Knox City, has two or three standard mares.
O'Farrel Bros., Canton, have several standard mares.
J. C. Hall, Lewistown, has two standard mares.

This list of 155 stallions and 259 mares includes the entire report in reply to the circular letter of Secretary Chubbuck, except a few of whose standard rank there was no accompanying evidence (such as numbers or references to register volumes), and whose claims to such rank seemed doubtful; but it is quite evident that it does not include all the standard animals owned in the State. A hasty glance through the advertising columns of Colman's Rural World, and the personal acquaintance of the compiler, adds the following:

Pleasant Hill Stock Farm, Equity Wilkes 6866, Argyle ——, Prince Middleton 11960, Falsetto ——, Star Middleton ——, Monterey ——, 19 mares and fillies.
Ashbrook Farm Co., Kansas City, Dalcolin 14925, Norfleet 14512.
E. M. Price, Rocheport, Hi Henry 4214, 5 mares and fillies.
B. M. Anderson, Columbia, Nimbus 10457, 2 females.
E. W. Stevens, Sedalia, Security 6471, Almont Fame 2799.
Overall & Morrison, Fayette, Fayette Chief 8894, Clipper 8895.
Pate Farm, St. Louis, Alley Russell 4502, Counsellor.
Ingleside Stock Farm, Columbia, Samuel G., William T.
Banker Boy 10474, owned by N. King, Columbia.
Parrish Chief 12003, owned by T. H. Hickman, Deer Park.
Revenue 1976, owned by T. H. Bagnell, Koping.
Major Nichols 11926, T. C. Graves, Slater.
Goodwood 4106, owned by M. Ervin, Oronogo.
Carnagie 8105, owned by T. W. Brandt, Montgomery.
Sans Peur 10231, owned by J. J. Lee, Leeton.
Prince Sultan 9782. owned by A. F. McKee, Browning.
Ben Wright 3989, owned by F. B. Fellows, Grain Valley.
Ranchero 3413. owned by L. S. Hatch, Hannibal.
Wilkesmont 2332, owned by A. Aymond, St. Charles.
Brownell 6064, S M. Wilson, Carthage.
D. K. Crockett, Columbia, has one filly.
H. H. Tandy, Columbia, has one mare.
Dr. A. W. McAlester, Columbia, has one filly.
Dr. Paul Paquin, Columbia, has one filly.

Even with these additions the list is certainly far from complete. Such a list, if complete, would be valuable in more ways than one, and it is to be hoped that when another such call is made the response will be general. THOS. LAFON.

Columbia, Mo.

SUPPLEMENTAL LIST OF STANDARD HORSES IN MISSOURI.

N. L. Hume & Sons, Monroe City, Red Chief.
S. J. Zink, Miami, Hannis Jr. 4393, Al. Wilkes.
L. S. River, Clarence, Java 9687, Felicity and two mares.
P. R. Smith & Co., Macon City, Le Roy 7747.
J. F. Coulter, Excello, Chartamont 8650.
J. Lynn Smith, Macon City, Booth ——.
Jno. J. Murphy, Macon City, Amblemont 12188.
W. H. Smith, Otterville, Napton 12551.
Frank Dood, Fayette, three standard mares.
A. P. Booth, Hematite, Bluewood 9296.
Leeton Stock Farm, Leeton, Sans Peur 10231, Leeton Boy 12946, and four fillies.
Spring Fork Stock Farm, Galley, Canonchet and five brood mares.
W. L. Hedrick, Warren, one filly.
Duval Stock Farm, Dockery, Col. Lillard 9389, Ethan McGregor.
Dr. J. F. Robinson, Windsor, Harry Hodgen 9449, Medley 7575.
Dr. Geo. W. Bates, Bates City, Viewmont 4444, Dave Wallace 8051, Conflict 7902.
G. B. Blanchard, Marshall, Dom Pedro 9179.
Luray Stock Farm, Bunceton. Royal Windsor 10295, Red Shawmut.
F. J. Grigsby, Arkoe, Callaway 12577.
Red Hill Stock Farm, Lexington, William V 8628, Reform Tariff 14177, and Xerxes.
Sweet Brier Stock Farm, Clinton, First National 9870, Joe Thorndale.
F. D. Terry, Kelpe, Monarchy 10610.
E. Knell, Carthage, Ben McGregor 2655, five mares and fillies.
R. Todhunter, Dover, Merchant 593, Electric 2670, Mercantile 11409, Nettlewood 12842, Eminent 12987, Silver Plume 15540, Ettington 15129, and twenty-one mares and fillies.
Platter Bros., Chillicothe, Ponty 12413.
Frost & Harvey, Pilot Grove, Messie Time 12387.
Dr. J H. Story, Clarksville, Stanton 5753.
S. M. Lane, Clinton, Bob Perry 7470.
Will H. Ewing, Pilot Grove, Luray Harold 13112, Nedwood 14967.
A. B. Alexander, Tipton, Tom Clayton.
F. J. Culler, Tipton, Count of Paris 12172.
Dr. J. C. B. Ish, Springfield, The Poet 9168, Metsa 11038.
C. J. Lamar, St. Elmo, Prince Brown 13943.
Clear Creek Stock Co., Clear Creek, Mambrino George.
Anderson Bros., Nevada, Principality 6009, Beware 8697.
Geo. W. Miller, Kahoka, Kahoka Boy 11527, 4 mares and fillies.
Robt. Blurton, Queen City, Greenbush Warrior 2061.
Geo. V. Saffarans, Palmyra, Otto Russell 12634.
B. G. Patton, Clarksville, Mirus 10209.
James M. Bevins, Liberty, American Clay 9403.
T. E. Williams, Macon City, Col. Hatch.
C. F. Clark, Mexico, Robert Rysdyk 6060.
G. A. Fewel, Windsor, Blockade 13554, and 2 fillies.

W. H. Smith, Palmyra, Kiowa 11113.
J. B. Legget, Palmyra, Clark Wilkes.
J. M. Nickell, Hannibal, Henry C. Misdeal 14496.
W. T. Dobyns, Shelbina, Milroy 12804.
Jas. G. Creveling, St. Louis, Culmination 11698.
Harrison Bros., Auxvasse, Tidal Wave and Light Hat.
F. Ehlers, Concordia, Grove Young 12986.
W. W. Allen, Lamonte, Loddie 12604, 2 mares and 1 filly.
Haverfield & Allen, Lamonte, Jay See Jay 4275.
C. H. Haerle, Gilead, 1 filly.
W. A. Bliss, Coatesville, 1 mare and several fillies.
Rev. E. J. Stanley, Lexington, Fashion 4149, and 2 mares.
Capt. J. R. Barnett, Lexington, Pathos 11044, Ellsto 11054, Red Ink 14424, Measure 14871, and 6 mares.
T. B. Campbell & Sons, Lexington, Ingomar, Edinburg, and 6 mares.
Jno. Willis, Corder, Prof. Wilkes and 2 mares.
Jno. H. Pinnell, Nevada, 1 mare.
E. H. Bainum, Maitland, Waukegan and 2 mares.
C. T. Donovan, Maitland, Clark Street 7197, and 4 mares.
Robt. Aull, St. Louis, Pride of Elysian 7204.

THE TROTTING HORSE.

[A paper prepared for and read at the 1891 series of Farmers' Institutes of the Missouri State Board of Agriculture, by THOS. LAFON, Columbia, Mo.]

In discussing the trotting horse on an occasion like the present, the questions that thrust themselves most prominently on our attention are two: First, what are, or what should be, the relations between the farmer and the trotting-bred horse? and second, will it pay the farmer to breed him?

The general farmer raises horses primarily for his own use: *i. e.*, to perform the labor on his farm, to haul his produce to market and his supplies to his home, and to carry himself and family about the country; but in order to be sure to keep his supply of horses up to his demand, he must needs raise something of a surplus, and having arranged for that, it naturally follows that he should try to make that surplus profitable, and by increasing it a little, both in quantity and quality, make the production of horses a not inconsiderable item among the various industries of his farm. It then becomes evident that the horse he should cultivate is the one that best combines the qualities of a farm laborer, a roadster and good seller. There are many different opinions as to what description of horses make the best farm laborers, but the average of the opinions of the men who are at the same time the most intelligent, most practical and most numerous, seems to be in favor of a horse about 16 hands high, of 1,200 pounds weight, that is light and active on foot, that has a bony structure, that is generous without being coarse and has a development of dense hard muscle, rather than a covering of loose, flabby flesh; that has a good constitution and plenty of heart and lung capacity to enable him to withstand the wear and tear of strong work every day, month in and month out; and that has the amiable disposition and high ambition that will prompt him to exert himself to the extreme limit of his capacity whenever called upon, in a pleasant and energetic manner, without showing the sluggishness of the Norman, or the fretful disposition of the thoroughbred. Such a horse as this may, and frequently does, come from any one of the half dozen different sources, but we are very strong in the belief that he will come far more frequently from the trotting-bred ranks than any other source.

The advocates of the draft breeds, in extolling the merits of their favorites, will claim that all other classes of horses are inferior to theirs for farm work, "because they are too small."

Now, we are perfectly willing to admit that, other things being equal, the largest horse is always the best, but it is a matter of fact and abstract experience that when any one quality is cultivated to an extreme extent, it is always at the expense of others. Thus, the draft horse represents one extreme; he has for many years been cultivated in the one direction of size and weight, and while he has attained them, which in themselves are desirable, he is correspondingly deficient in density of bone and muscle, in vitality, in quality of feet and legs, in activity and ambition.

The thoroughbred race-horse represents the other extreme. For a great many years he has been cultivated in the direction of excessive stamina, powerful vital organs, firm, hard muscular development and high courage; these qualities he possesses in greater proportion than any other horse, but they carry with them the light frame, the excessive nervousness and the uncertain temper which unfit him for excellence in any other walk of life than that which he finds on the race-track. The ideal farm-horse should run to neither extreme; it should be the aim of his breeder to appropriate desirable qualities wherever he finds them, and to attain as nearly as possible the harmonious balance between the two extremes that will produce the most effective horse.

We believe that the trotting-bred horse approximates this balance more nearly than any other horse that lives, and that the breeder, by making judicious selections within the standard, will have the advantages of the progress already made. Most of the recognized trotting families already possess a considerable dash of thorough blood, so it would be useless to step outside the standard in quest of benefits to be derived from it. Where the large size, that some of our trotting families show, came from, is not so clear, but that matters little as long as they possess and perpetuate it, so it is useless to go outside the standard for that.

Some people who are not well informed may deny that there are trotting families that can be relied on to produce 16-hand-1,200 pound horses. In support of our assertion that there are, we offer the following extracts from the official records of the trotting turf: Great Eastern, 2:18 in harness and 2:15½ to saddle; Gloster, 2:17; Fanny Robinson, 2:20½; Convoy, 2:22½, and Alta, 2:23¼, were all 17 hands, or more in height. Humboldt, 2:20; St. Valentine, 2:20; Gladiator, 2:22¼; Big Fellow, 2:23½, and several others with records better than 2:25, were 16½ hands high.

We do not know the exact weights of these horses, but we have seen perhaps one-third of those mentioned, and know that they were not lathy weeds, but horses of at least average substance; and by that term we mean that they possessed enough substance when in full flesh to weigh from 1400 to 1500 at 17 hands high, from 1300 to 1400 at 16½ hands, and from 1200 to 1300 at 16 hands high. Also, by full flesh we do not mean the mountains of loose fat so frequently seen on draft horses, at which condition their weights are quoted to the public, but the amount of flesh that the trotter will naturally put on during his winter vacation, ordinarily fed.

It is reasonable to infer that those of the above quoted trotters, of whose weights we have no direct evidence, were horses of the same calibre, if for no other reason, because they developed a high rate of speed, for lathy weeds do not trot fast. The above mentioned horses do not by any means complete the list; they are only a few of the largest and fastest, and are quoted as samples of what trotting blood can do in the way of producing animals that are above and beyond the recognized farm team size of 16-hand-1200-pound horses. Mr. J. M. Hendrick, of Union Springs, New York, has within the past five or six years, over the *nom de plume* of Aurelius, earned the reputation of being one of the clearest thinkers, most studious and most instructive of modern writers on the trotting horse. He has an article on the horse show of America, which recently took place in Madison Square Garden, New York, in Wallace's Monthly. In describing the rings in that show, he says:

> The draft classes were greatly neglected; a few entries of good quality were made, but to award premiums to imported horses when so many good native horses might be shown, is a blow at the breeding interests of the country. The show needs a draft premium for the best horses of any breeding, for I know that the trotting-horse breeders of the country would like to have an opportunity to

show that the breed is good for draft work as well as track use. The draft classes are made up in the interest of the importers, being confined to registered animals. While this is all proper, still a class, open to all breeds would, I think, be a welcome feature to exhibitors. The same might be said of the coaching classes. The trotting-horse breeders would like a chance to show their stock against imported animals for coach purposes, and it should not be denied them.

If such authority as Aurelius advocated the pitting of trotters against Clydesdales, Shires and Normans, in their own special field, that of heavy draft, they certainly have some chance against them; and if they have any chance at all there, the trotter will certainly beat the foreigner "clean out of sight," on the debatable ground of light draft or farmers' horses.

So much for the labor directly on the farm. The second qualification necessary to the farmers' horse is that he shall be a roadster, under the saddle as well as in harness. It will certainly require little or no argument to convince the most skeptical believers in the general excellence of the trotting horse, that he is the best roadster in the world. It is his specialty. Indeed it is the glory of the American trotter that while he is a sporting horse, his greatest excellence lies in his ability to perform his share of the labor of the nation, and in the fact that he is essentially a business horse. It has been claimed by some who know little of his qualities, that he can road well only when hitched to a very light vehicle.

Ordinary daily observations and private experience with the trotters show the falsity of this position, but it is difficult to prove it by official and decisive tests, because there are no races made nowadays that will test this point. We can think of but one in the whole history of the trotting turf. It must be nearly or quite thirty years since Dan Mace took charge of a fast trotter that was large and stout. He soon found that she was a great weight puller, and thereupon offered to match her to trot a mile out in three minutes pulling a ton weight. He soon found a taker; the match was made and trotted, the mare winning with something to spare. If our recollection of what we read about this race is correct, the mare that trotted it was Highland Maid, the same that trotted a race or two with Flora Temple, and the place was the Fashion course, Long Island. It is probable that twenty trotters could be found to-day that are capable of doing that or anything else that any horse of that day could do. Highland Maid on that day pulled 2,000 pounds one mile at the rate of twenty miles an hour. Eight miles an hour would be fast and 1,000 pounds a heavy load for the ordinary road work of a farmer.

As far as saddle work is concerned, it is morally certain that the trotting-bred horse can easily be taught to saddle well enough for ordinary road purposes. Any horse that is quick, handy and intelligent will soon acquire that, for some trotting-bred horses are so tractable that a little care in their education will enable them to pass for well-bred saddlers. There is a stallion now standing in Boone county, that is a striking example of this fact. He is advertised as a "famous Kentucky saddle stallion," but his pedigree, as published, instead of containing saddling crosses, which are "conspicuous by their absence," shows that his sire was a trotting-bred son of Magic 1451, sire of Clemmie G. 2:15½ and several other 2:30 performers, and his dam was five-eighths thoroughbred (the rest not mentioned and probably not known). As an individual he is quite good; saddles well, takes premiums in saddle rings at fairs, stands at a twenty dollar fee, and, it is said, does a good business. Now, here is a horse whose dominant blood is trotting blood, competing successfully as a saddler with horses, which as saddlers were "born in the purple."

Of course we would not advocate the use of such a horse as a sire, but the point is, that if one trotting-bred horse can be made such a fancy saddler, the rest can, if necessary, be made to saddle well enough for ordinary road purposes.

The third qualification for the farmers' horse, and a very important one, is that he should be of the kind that sells well. Here again, we imagine, little argument in favor of the trotter is necessary. The most superficial observer of the horse markets knows that no other strain is likely to produce a horse that will bring $105,000, as did Axtell, or one that will bring $51,000 in open market under the hammer, as did Bell Boy, or an untrained two-year-old that will bring $25,800 as did the Mascot, or a yearling colt that will bring $24,100 as did Voodoo, or a weanling that will bring $8,500 as did Palo Alto Belle, or a sixteen-year-old brood mare that will bring $15,000 as did Alma Mater.

These extreme prices are from 30 to 70 per cent higher than the extreme prices for which any other classes of horses have been (with one unnotable exception) or are likely to be sold, and the moderate and lower priced ones will be found to bear about the same relation to each other. A nicely bred standard colt always commands a quick sale at a remunerative price, and the more fashionably he is bred the quicker the sale and the better the price. For example, it would be easier to sell a yearling by Nutwood or Alcantara for $1,500 than it would be to get one-tenth of that money for the get of an obscure stallion with just breeding enough to get him into the standard. Either will pay for his production and leave a margin of profit, but the difference in using a good and an indifferent sire, even though both be within the standard, is reflected in the profit.

One of the attractive features attending a venture in trotting horses is the great possibilities it involves, for there is always the chance of a bonanza in the shape of a Goldsmith Maid, a Maud S. or a Nelson. It is quite possible that any ordinary farmer should raise the future king or queen of the turf. It has already been done several times by such men, and may be again.

No farmer that has any fancy that way and is inclined to give horse culture a little extra attention should be deterred or discouraged by the fact that great breeding farms, backed by all that capital, skill and brains can do for them, are springing up all over this broad land. These large establishments enjoy some great advantages, it is true, but they are also confronted by disadvantages which are peculiar to themselves, and with which the ordinary farmer does not have to contend. In but one single instance have these large establishments succeeded in producing a trotter that reached the top round in the ladder of fame, and that was done by Woodburn, the first and oldest of all these great enterprises, when she produced the present queen, Maud S. All other kings and queens, from Flora Temple, who was the first well-defined queen of the turf, down to the present day, have been bred and raised by small farmers or men with whom the raising of horses was merely a side issue.

It is sometimes objected that the producer of a star performer rarely gets an adequate compensation, because he has to sell him undeveloped, for a small price. This is no objection at all, but rather an excellent way for a man of small means to make money with trotters, if he has the sagacity and nerve to breed them right.

Maud S. was sold from Woodburn, as a yearling, for $350, but the reputation that she made for the farm brought hundreds of thousands of dollars to its coffers. Jonathan Hawkins sold Dexter for $400, and four years after he brought $33,000, of which Mr. Hawkins did not get a cent; but the reputation Dexter made for him and his little bunch of stock made him rich, and he died worth considerably more than $100,000.

Trotting-bred horses are now being produced in vast numbers all over this broad land, and the prophecy that the supply will largely exceed the demand, resulting in a gigantic panic, is sometimes made, but only by those whose range of vision is limited.

The demand in our home markets is more than keeping pace with the increase in wealth and population, and our export trade is already something of an item. Our trotters are attracting attention from all the civilized nations of the globe, and large sums of money are frequently brought into the United States and left in exchange for lights of the trotting turf.

In 1887 a wealthy Cuban gentleman had the stallion Milton by Smuggler over in Europe. He was driven by an Austrian, and his success, in the best company that Europe afforded, was moderate. After the trotting season was over the gentleman returned to the United States and bought Misty Morning 2:21, and Mollie Wilkes 2:22¼, and engaged Chas. Dickerman, an American trainer and driver, to pilot his trotters. The next season his little stable was quite successful, capturing many of the richest prizes of the French, Austrian and German trotting turf, which pleased him so well and encouraged him so much that he dispatched Dickerman back to America with orders to purchase ten colts and fillies, which are to be matured and trained on European soil. They have now been in France about one year and have still to give an account of themselves, but we have faith to believe that their future career will throw no discredit on the land of their birth.

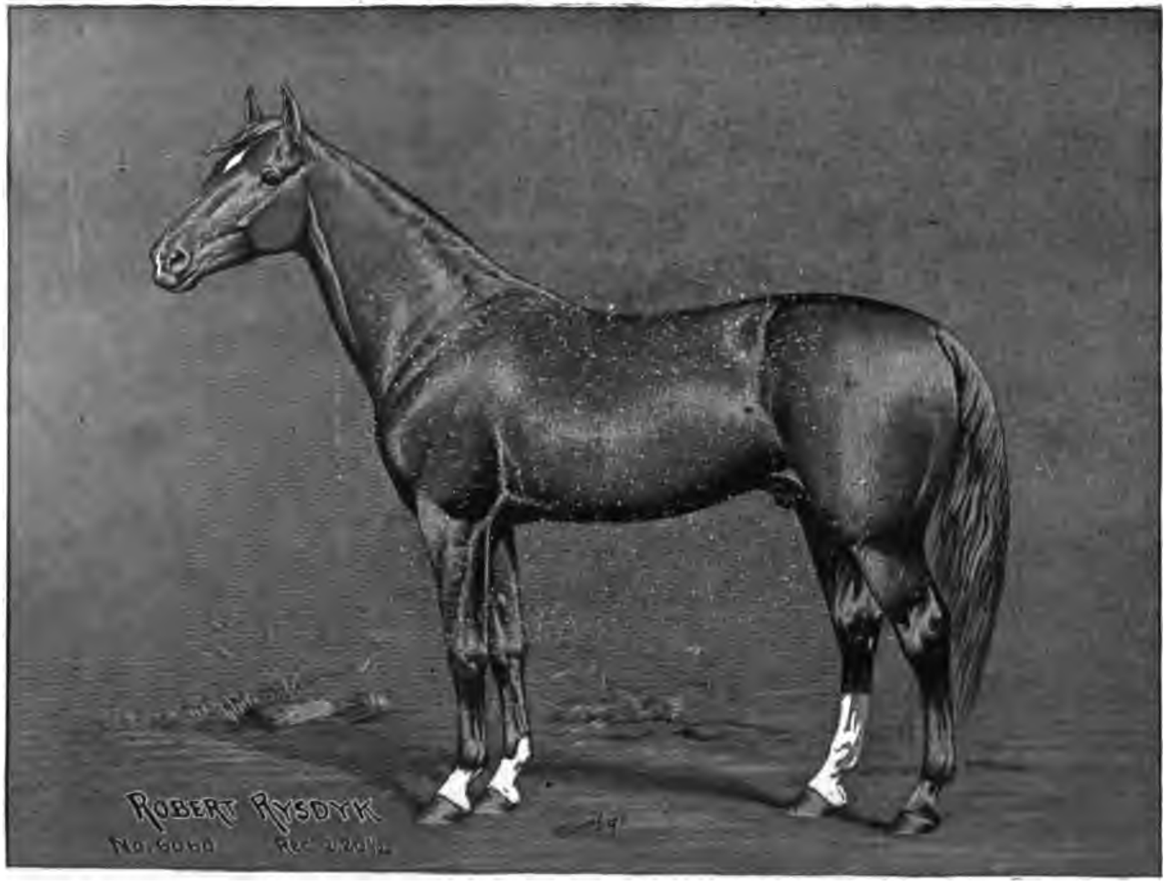
Within the past few months a "Trotting Union" has been formed in England. This is an organization somewhat in the order of our National Trotting Association, and is intended to foster, encourage and protect the trotting interests of the land. England is a conservative nation, and the very fact that this "Union" has been created within her borders is proof positive that English, and in fact, European trotting has come to stay and is an established fact. What will be the result? Why, that trotting as a sport will grow as it has in America; from a public sport it will spread to a private amusement, and road riding will become popular and fashionable; that the trotting stock for track use, road use and the breeding stud will all have to be exported from America; and this in England, France, Germany, Austria, Italy and Spain, for in all these countries, trotting has in recent years obtained a foothold.

We fully believe that in ten years every one of the countries will be receiving regular shipments of trotting stock to supply the demand in their markets, and they will all have to come from America.

What then becomes of the short-sighted fear that we are overdoing the breeding business, and that the bottom is about to fall out of everything? Instead of retrenching, let us rather enlarge and improve our resources, both in quantity and quality, that when the foreign markets open up to us in real earnest, we may be ready for them and thus be "in the swim."

The trotter is a purely American production, and we as Americans should and do respect, admire and feel proud of him.

It is now nearly three years since we stood in a French court-yard in the heart of Paris, in the presence of Milton, Misty Morning and



OWNED BY

C. E. CLARK Mexico, Mo.

Molly Wilkes, and, last but not least, old Charley Dickerman; and, as we fondled the velvety noses and stroked the satin coats of the grand stallion and the two bonny mares, and looked into the honest eyes of the American trainer, and glanced at the American sulky standing near, the whole group seemed so immensely superior to its foreign surroundings that our breast swelled with pride of country, and our heart glowed with the thought, "I, too, am an American."

BREEDING THE TROTTING HORSE.

[A paper by F. J. Grigsby, Maryville, read at the Farmers' Institute.]

Ladies and gentlemen—representatives of the agriculturists of the northwestern portion of the grandest State in the Union: I come before you the champion of the noblest branch of all our agricultural pursuits. To make excuses would be to defend myself for being a breeder of trotting horses. I might as well excuse myself for being a man. If you have eyes and use them, ears and apply what you hear, you know to-day there are opportunities for the poor man and small farmer to start intelligently. The literature of the profession is no longer held at high prices. In our own State we have two agricultural papers, Colman's Rural World, St. Louis, and the Live Stock Indicator, furnished at $1 per year, and both, in addition to market reports, have good horse departments. Clark's Horse Review, published semi-monthly at Chicago, in the interest of the trotting horse, comes at $1 per annum. With these you are better prepared to begin in the business than I was, for while I was fairly successful in some of my first purchases, it was more luck than knowledge.

Those who have capital and will take the trouble to study the business can commence with a very small chance of failure. We have in our own county opportunities now that were not open to the small farmers a few years ago. Our land is free from stone and much of it has nothing to interfere with smooth, easy cultivation; the man who does his work with a pair of mules or a pair of geldings can do it as well with three good mares. There are to-day in almost every county and in nearly every township good standard and registered stallions standing at a fee of $25; by breeding to two of these in the spring, one early and one late, and one in the fall, you have a working team all the time. The horse colts can be gelded, and will sell for prices fully as remunerative as any other class of breeding. From the same mares save and breed the fillies, and in a few years you will be able to dispose of your foundation stock and have young mares coming on; you now have mares that are standard producers for the farmer just starting. A $25 or a $50 horse, if standard and a good individual, is yet good enough. Still geld the horse colts and save the fillies and in ten years, with care and good judgment, you have nothing on your place but standard mares; you have sold two sets of mares that have done your farm work in as good shape as any animals you could have had, and you are now ready to breed to the horse or strain of blood you may have decided is or will be most in demand. Your colts, both horses and fillies, are standard, and your top cross will sell almost anything you may have for breeding purposes. But if you now stand back for a $25 or a $50 sire, in all probability you will not get the prices your neighbor does, who goes to a Nutwood, a Red Wilkes or an Axtell; you have got where at a medium cost you need not be particular about expenses; your colt will sell for a profit at weaning time, even though you pay a fee of $500 for the service of a stallion.

This is no fancy sketch. As you are aware, more money is being paid for this class of horses than any other; for instance, Axtell sold for $105,000, Bell Boy $51,000, Stamboul $50,000, Alcazar (two years old) $26,000; $1,000 was offered and refused for a two-year old filly, bred in this county this season, and a yearling filly was recently sold for $1,500 in this county. Now, here is a living profit for the breeder, better than you can realize from any investment on your farm in crops or live stock. Where can you secure such profits in any other legitimate business? No one can monopolize the markets, or set your prices; they cannot be interfered with. You have your individual colt; you show him, and your purchaser is ready to give all he can see in him for track or road, and you may go back to your farm and produce another, and, if possible, a better one. There is also a satisfaction in watching the growth and development of such an animal, you can never have in growing stock to sell at so much per head or so much per pound. Here is an animal that you have created for the purpose of going over a long distance in a short time, and you have made your selections because his ancestors have been noted for their powers in that direction, and because you think that you have been able to more judiciously blend the individuality of the ancestors than others have been able to do. It is a busines where profit and pleasure combine more nearly than in any other business known to man. Association even with the more intelligent quadrupeds makes us better men. Any one can breed and raise a draft horse: you breed for size and feed for ponderosity, and if he does not get an eye knocked out or develop a spavin or ring-bone before he is three years old, you can sell him for from $75 to $200, and look around for another crib to put your next year's corn crop into. The mule is the easiest bred and best draft horse, and while it requires a higher grade of intelligence to breed him than it does the scrub and the draft horse, the profit is more certain. It is my province to show the farmers here assembled, that there is profit and pleasure to the small farmer who only breeds one or two colts each year to breed the noblest of all the animal kingdom, the American trotting horse; and if I shall have convinced some doubting brother who has been almost persuaded but feared to start, my purpose will have been accomplished, and this paper will not have been written in vain.

THE SADDLE HORSE.

[An address by J. A. Potts, President State Board of Agriculture.]

In discussing this topic I do not expect to take up and criticise or extol to any great extent all of the different kinds or breeds of saddle horses, for they vary almost as much in size, form and gaits in this and other countries as the style of garments worn. The saddle horse of Europe, known as the Hunter, is probably the strongest saddler used, and is able to carry a greater weight at a higher rate of speed than the saddle horse of any other nation. The Hunter is simply a large thoroughbred, 16 hands or more high, with a short back, strong loins and a good, flat bone. His natural gaits, and the gaits in which he is used, are walk, trot and gallop, the last named being the most fashionable and greatly used. Even in the United States, our saddle horses vary greatly in different localities. In our Eastern states they have, and appreciate them very highly, a horse known as the walk, trot and lope horse, which differs somewhat from the English Hunter in breeding, form and gaits, the American horse having less of the thoroughbred blood, and generally being mixed up more or less with the Morgan family, nearly always from one to three inches less in height, more compact in build, has more knee action, and very much inclined to prance.

In the Southern states we have what is called the walking horse, which is the most pleasant and comfortable road horse of them all, and is appreciated more in the South than any other place. His beauty and dash are not what constitute his value, for he rarely ever possesses either; he generally goes as if the center of gravitation had a wonderful effect upon both his head and tail, constantly nodding his head when moving, as if doing obeisance to some unknown and unseen spirit. He is valuable for the solid comfort and service he renders his fortunate owner.

The horse I wish to pay the most of my respects to in this discussion is the horse known as the Kentucky Saddle horse. He is the pride of the equine family, and possesses more beauty, grace of action and tractability than any of the other breeds. In him we have the fire and blood of the English thoroughbred, direct from the loins of the old four-mile race-horse, Denmark, who is the father of a family of saddle horses that is the pride of America to-day. Their royal carriage, their proud and light step, their tractability, and the grace and style with which they carry their rider, coupled with the ease in which they can be controlled, and made to walk, trot, fox-trot, rack, or canter, and to change from either to another gait with but a slight touch, or a motion of the body, whip or rein, mark them as a royal breed. Nature and cultivation have raised them to a higher standard than any other horses have yet been placed. It is but natural that such should be the case, because beauty, symmetry and grace of action have been the beau ideal of the breeder, and there is more sympathy between a man and his saddle horse than there is between him and any other kind of a horse. For example, a man sitting up behind a driver of any kind, forcing him along with a whale-bone or a black-snake whip, the weapons most commonly used by drivers, does not place the horse on very sympathetic terms with his driver; but if he is on his back where he can reach forward, stroke his neck and pet him, he soon becomes in sympathy with his horse and his horse in sympathy with him, which thereby enables him to more easily develop good qualities in his horse and temper his disposition.

It may now be in place and proper to give some of the important points that enter into the conformation of the saddle horse of which I am talking. In the first place, his head should be set like an astronomer's, skyward, and have plenty of brain development to go with it; small muzzle, large and well-extended nostrils, fairly wide between the eyes, eyes large and bright, but mild, ears thin, long and artistically set upon the head, long, arched neck, placed high on well-inclined shoulders, deep chest, forelegs near together, long arm, short knee joints, large springy pasterns, short back, good broad loins, well-rounded hips, heavy tail, naturally carried high, good hard, flat bone, and sound feet, firm, glossy coat of solid color, combined with the most approved strains of the Denmark blood, with size to suit your fancy—you then have a model saddle horse, or one that can be easily made one by a little training, which should be commenced early in life; the sooner the better, to secure the best results.

If you work or use the mother, I conceive of no better time to begin a colt's education than when he follows her; for then there is

MONTROSE.

Property of T S and J HARRISON Auxvasse Mo but little danger of the colt hurting himself or the handler, and can be easily managed, taught to lead, stand hitched, and be given all of his elementary education in such a way that but little time will be consumed or little risk taken. It is important that the colt be taught to walk before any other lesson is attempted, for if this lesson is neglected, there will always be an awkwardness about the horse during his life, that will be very unpleasant to his handler and unsightly to the public. After your colt has been taught to walk in a proper manner, the next step should be to teach him to trot. If he is inclined to rack or pace too easily, it is best to use a snaffle-bit or a bridle that has two sets of reins, one attached to a curb and the other to a snaffle-bit. When a colt is allowed to trot, it should be but for a short distance at a time. He will then be able to show up in good shape. If you go too far and fag him, he will make a bad exhibit. After your colt is thoroughly broken to walk and trot, and old enough to ride, the next lesson should be to teach him to rack. In doing so let him start off in a good trot, sit back a little in the saddle, check him with the curb, at the same time raise his head slightly, which is very liable to start a colt to racking; continue in that way until your colt will rack smooth and frictionless. Do not let him start from a walk to a rack, at first, as it is liable to cramp his gait in such a way as to detract from his value very materially. The best and probably the easiest gait to teach a horse is to canter; which should not be attempted until all the other less natural gaits are thoroughly established.

There is another very important thing in handling a saddle horse, which I will here mention: that is shoeing; nine times out of ten mistakes are made in shoeing, in having the front shoe too heavy. If your horse is pacing inclined, increase the weight, if trotting inclined, diminish it, is the best and most important rule, and is more used than any other. There is too much in this subject to attempt it in detail in one paper, and I will but point out most of the important features.

We have now the model saddle horse, and have him shod, but still he is not recognized and appreciated in many ways as his importance and usefulness merit. Even at our agricultural fairs it is so plain and patent to you all that the saddle horse does not receive his proportion of consideration, it would be wasting time to undertake to argue it. Therefore, I will simply state the fact that $100 is given to the long-legged, bony, ill-shaped, heavy-headed, booted trotter, to $5 for the saddle horse. I can see no other reason—good reason—for so doing, than that it takes so much more force to make a trotter attractive than it does a saddler, and the fair associations aim to equal them up in this way. If it was known and made public that $500 would be given away for the best saddle horse, mare or gelding, by some enterprising fair association, which would be less than one-half of the amount often given in one purse to trotters, pacers and runners, what kind of an exhibit do you think would be made? There have been exhibits made at some county fairs in this State for $25 premiums, that were more enjoyable to the true lovers of the horse than has often been made by trotters, pacers and runners for the thousands hung up for them. I believe one cause of this is that the saddle horsemen, as a rule, are modest and unassuming, and do not fill the air with their howls, or circulate thousands of dollars worth of literature filled with their great deeds, either real or imaginary, as do the trotting and running horsemen. There is an air of refinement and elevation that goes with the saddle horse, which is enjoyable and refreshing; while on the other hand, trotting and running horses carry with them a germ of desperation and vice that may creep in and take possession of their proud owners when they are least aware.

THE DRAFT HORSE.

[A paper read at the Edina Farmers' Institute by Mr T. BUTTERWORTH, editor of the Agriculturist, Quincy, Ill.]

We were pleased to receive the invitation from Secretary Chubbuck to write a draft-horse article for your Farmers' Institute, first, because Missouri is our own native State, and in the second place, because we are interested in the noble draft-horse as the greatest benefactor of American agriculture. Although an agricultural editor is always too busy to write long essays, we will give you a few brief thoughts that suggest themselves for your consideration. We are proud of the success of North Missouri in improved stock-breeding, notably the draft-horse; large numbers of imported draft and coach sires have been introduced to every county, and already the Eastern horse buyers are eagerly hunting up your grade draft horses before they are matured. Your climate and soil are especially adapted to stock-raising, and no State raises better horses of all classes. The draft horse has given a new impetus to horse-raising; he has elevated the standard of dignity, usefulness and profit.

When I was a boy these wild prairies grazed droves of common, small horses; almost every farmer was horse poor; there was no profitable demand or market for them, and a horse was a horse if it was not a mule; all were equally small, and the horse jockey was about the only one who made any money out of them. Then horses were traded off with very little money to boot; now we have established markets that want good horses for cash, of special types for special work, and they buy them according to their merits.

The draft horse must have good size, good feet and form; the coach, carriage, saddle, and light harness horse, each has his special class, that governs the price. The breeding of draft horses has opened up a new industry to American farmers. The introduction of the draft horses of Europe, known there as the agricultural horse or cart horse, has revolutionized horse-breeding and made it the highest type of our breeding. True, it was a radical cross contrary to the teaching of all theorists to breed the large sires to the smaller dams; even yet some are skeptical, but the practical experience with the thousands of imported heavy draft stallions has demonstrated its unparalleled success and given to us the grade draft horses of increased size, strength and usefulness, to suit the progress of the age, and as we increase the size, the price increases. The city merchants and manufacturers have found the heavy grade draft horses last longer and do more work, hence they readily pay higher prices for them, and are eager to get the finest large horses to be had; the best sell first at the first prices.

Our professional fast horse friends, like the politicians, are ever anxious about the farmer; they cried with alarm, you will soon over-do this draft horse business; that was their kindly warning back in 1870 when we began to import the draft horses by the dozens; but the popularity of these horses and their successful breeding increased, and by 1880 we were importing them by the hundred. The continued demand of the Eastern horse buyers for larger, heavier horses and more of them completely dispelled the idea of over-doing the draft horse business. The importation of Old Louis Napoleon in 1851 and successors in 1868 from France was met by prejudice and jeers, but they finally proved their usefulness and superior breeding; then came the Clydesdale from Scotland, followed in a few years by the Shires from England, and more recently by the Suffolks and Belgians. At first the French horses were called Normans, and the French grades are still called Normans in the large cities, where the clean-legged dapple grays are great favorites. The rivalry of leading French horse importers soon created the division, and two stud books were formed; some importers selected their horses only in the ancient province of La Perche, where they are called Percherons; other importers selected horses in Normandie, and the Boulonnaise district as well as in La Perche, and called them all French draft horses. The French breeders had no stud book and cared nothing for pedigree, declaring their horses were all de trait pure, but American enterprise soon established the Percheron stud book in La Perche, which was followed by local stud books in Normandie and

Boulonnaise, and in the Nievernais they publish a stud book for black horses; and in 1886 the Societe des Agricultures de France established the stud book de Trait Francaise for all French draft horses.

The Clydesdale association of Great Britain was the first European draft breed to have a stud book, which was soon followed by a second stud book, the select Clydesdale, combining the blood of the Scotch Clydesdale and the English Shire. Now we have the two corresponding stud books in America. The English Shire horse has only one stud book in England and one in America, likewise the Suffolks. The Belgians have two stud books in Belgium and one in America. Of the Coach horses the Cleveland Bay and Yorkshire were the first to be imported to this country; they each have a stud book in Yorkshire, England, but one stud book in this country, as we recognize them as one breed.

The French Coach horses were first imported in 1886; their pedigree we find recorded at the French Government Haras or breeding stables, dating back for more than 100 years. The American-French Coach Association has been organized to publish a stud book. The German Coach horse and the English Hackney horse have each a stud book in Europe and an association in this country.

"THE AMERICAN DRAFT HORSE"

Is being rapidly developed from the blood of the several draft breeds so liberally imported from Europe. American skill, climate and feed, with the abundant supply of all the best breeds of Europe bred upon our American foundation, are already developing flattering results. The American draft horse will attract the admiration of the European cities, for he will have size, strength and style, with American snap and vigor. There is yet no organization and no stud book for the American draft horse, but it is not far in the future that our breeders throughout all the horse-breeding states will unite in organizing an American draft horse society to publish a stud book, and further develop the American draft horse of the American model or type, with the additional requirements of superior individual merit, which none of the other stud books do require. Thus will the high standard be set to build upon and develop the American draft horse, with the good qualities of all the other draft breeds to suit our requirements for a large and powerful draft horse, with superior action, courage and intelligence, and as the model of beauty and utility to suit the American taste.

We should not be content to raise cheap bread and meat for other countries; they want good heavy draft horses and large, stylish coach horses; they do not ask that they be cheap, but they must be large and fine. We have made a good start, but we have not progressed far enough. The markets want 1600 to 1800-pound draft horses, which even in these times command big prices. Our recent Chicago markets report the sale of some good 1600-pound horses at $250 to $300 each, yet there is no market for small horses. The world is our market, and the whole world wants big draft and coach horses at big prices, but we have not got our grades large enough for the European markets, nor even heavy enough for our own city markets, which now want them as heavy as the European full bloods. We should not expect with light draft horses to get big draft horse prices. Success in horse-breeding in this day and age is won by intelligence and skill to breed what the markets require, increased size with good all-round quality.

"CARE AND MANAGEMENT"

Of draft horses is not materially different from that of other horses; good clean feed and water regularly given, and they will seldom miss a meal or be out of condition. If stabled, give them clean hard floors to keep their feet sound. The French generally have cement, stone or brick floors, with good bedding at night, and they water their horses before feeding, give salt regularly, either in the feed every day or keep a lump in the feed-box, and where horses are stabled have good ventilation; pure air next to pure water is essential for breeding stock. Give the mares the run of the pasture, with shelter from storms and rough feeding in winter when not at work, for the best success in regular breeding; but regular farm work is better for the draft-brood mares than idleness, as they are generally kept too fat for want of work; thus it is the small farmer, whether it is here or in France and England, is the most successful breeder of good horses. We have much yet to learn of the science of breeding, and as we improve our horses, we will improve our system of breeding, give more attention to the details of successful breeding, born of intelligence, skill and experience.

The colts should be liberally fed for early maturity to get that fine, large growth so desirable; give them the run of the pasture, with good stable feed. The quality of feed for colts is important; it should be of oats, bran and hay to form bone and muscle rather than to feed corn for fat, although most of our Western colts get more or less corn, which, if fed too liberally, develops the soft-jointed, meaty-legged, stupid, fat beasts better suited for the butcher than for work. The draft horse should be bred and fed for good action, intelligence, courage and vim. Another advantage the farmer has raising a few colts on the farm: the colts can be regularly handled from the first, and they may be put to work early to share the farm work with the brood mares and earn their own living. Keep the colts' feet trimmed, and keep them away from barb wire.

THE KIND OF HORSE TO BREED.

The question of the day is what kind of horse to breed. So long as American farmers find stock-raising the chief reliance, draft-horse breeding must be the most profitable and substantial branch of agriculture. So long as the cities and factories continue to grow, so long will the demand for good draft horses continue, and good prices be maintained in all the leading markets of the world. While many farmers content themselves with using small scrub horses on the farm, it does not pay to raise them; better raise a big high-grade colt that will at maturity sell for enough to buy two little horses. The farmer that will content himself with only small horses to do the farm work generally breeds to a cheap horse and raises a cheap colt, while the more enterprising farmer breeds to the best imported horse available, and raises a colt to be proud of, that grows rapidly, and when two years old is so well matured that he can work enough to pay his board, and, when three years old, drive to town with a load, and he can take a load that is a load. The horse buyers are continually asking your price for that horse, while the farmer driving the little scrub never is asked such questions. But it pays to keep these big grades until they are four or five years old to thoroughly mature and harden them for the city work. The dealers who are eager to buy our young draft grades have them matured further east and double their profit. It pays our Western farmers to keep them to maturity. Few farmers can afford the luxury of a non-producing team of geldings or mules that cannot breed.

Many of our Western farmers find the draft mares the most profitable and the most practical farm team for heavy plowing with a big plow, for hauling all our heavy farm machinery, for taking large loads of grain to market and large loads of manure to the fields, and when once we use them on the farm we will never do without them. Some here may say they are too big and clumsy and too slow for them. The model draft horse is not clumsy or slow; the American draft horse is not bred on that line; as to size, we want all the size we can get; there will be, in spite of our best efforts, too many small horses.

We must have better mares to raise the better class of extra heavy draft and coach horses for the city markets. Grade up as fast as possible, keep all the good mares and they w. breed better with each additional cross; breed to the best of sires and you will have the best colts. Then you will take better care of them, and best of all, get the best prices. You will not have to hunt a buyer or sell on time. If France, with her 3,000,000 horses, has increased her exportation from 10,000 in 1880 to 36,000 in 1889, what might we do in ten years with our 14,000,000 horses if they were only the right kind, if they only had the size for the foreign markets. Our export of horses last year was less than 4,000 head; let the good work of improvement go on until American horses are the equal of the horses of any European country, and good enough to suit the best markets of the world.

"THE AGRICULTURAL HORSE."

The draft horse has taken the front rank in all the great agricultural countries of Europe as the agricultural horse, and is fast taking his proud position in this country; he is winning his way upon his merits as the horse of utility. However much we were wedded to our native horses, we are too practical to overlook the value and usefulness of the draft horse in our improved agriculture, as well as in the crowded streets of commerce. America leads the world in progressive improvements, and we could not longer let the Old World have better horses than we raise. We find in visiting the agricultural districts of France, Belgium, England and Scotland, that the farmers use the full-blood draft horses for the farm work generally—the large, heavy mares and young horses before they are old enough for market. Indeed, most of our imported draft horses have worked for their own living a year or two on the farm, and they are all the better for it. Formerly we thought the half-bloods too heavy for the farm, but we have become educated up to the better appreciation of their merits and now many farmers boast one or two teams of high-grade or full-blood draft mares. A pair of high-grade draft mares will make every year as much clear cash as a forty-acre farm, and no luck, no gambling, but strictly business.

The farmers and breeders have been getting experience, and out of the great work we have developed the American draft horse, and the West has marketed many thousands of grade draft horses that have brought us so liberally of the Eastern gold. This grade draft horse has taken the foremost position in our stock-breeding, and has been less affected by the depression than any other classes of stock. The draft horse enthusiasm is still marching to the front, with the best men in the land breeding the best horses in the world to supply the best markets at the best prices.

THE STATE FAIR.

[A paper by Hon. C. F. CLARK, of Mexico, presented at the Farmers' Institute, held at Mexico, Mo.]

The honorable Secretary of the State Board of Agriculture, in calling this Institute, doubtless did so with a view of having a full and fair discussion of some of the topics relating to agriculture, and among many of the important subjects selected to be discussed is this: "Shall Missouri Have a State Fair?" What we farmers in this and other states need most is a better knowledge or a more thorough understanding with each other, and substantial facts of our true condition, founded upon principles and figures. To be better able to secure these truths and figures, we should see and know more of each other, more of our labors, successes and adverses, and should understand thoroughly and be in full sympathy with all of our producing interests. The agriculturists, the miners, the horticulturists, the mechanics, the manufacturers and the stock-raisers are all brothers in the same common cause, and constitute all the component elements of state. To them alone is the credit due for snatching Missouri from nature's arms; subduing the prairies, clearing up the forests, turning them into happy and prosperous homes, and placing her in the most enviable position she now occupies in the great galaxy of States. Not to any one or any two of these professions is the honor alone due—no more so than full credit would be due to one or two wheels of a watch or clock for its completeness. It requires them all in one body. They together constitute the great protecting machine of state. It is just as important for us to understand them all, and the relation they bear to each other, as it is for an engineer to understand thoroughly every part of his engine, or for a doctor to know the anatomy of the human system before he is competent to prescribe for its wants. The question now arises, "Is there any better way to secure this knowledge than at a State Fair?" I think not. We should meet annually at some available centrally located place, designated by a board of directors composed of fifteen members, one selected from each congressional district in the State, and one appointed by the Governor at large, which would give all parts of and every interest in the State its proper representation, and then offer suitable premiums for all the important products and industries of the State, according to their merit, which should be provided for by the Legislature.

If we will now consider but for a moment our great and growing agricultural interests, the variety and quality of our horses, cattle, sheep and hogs, the number and diversity of our mines, the extent of our manufactories, and the many other less important products too numerous to here mention, we could have a partial idea of the vastness and grandeur of an exhibit that could be made by Missouri. I can say without fear of successful contradiction that there is no other state in the Union that could approximate an exhibit that we could make. The drawing together of a large number of people, laboring in the same field, and allowing them an opportunity to exhibit the fruits of their industry, discuss points of merit, recite their experiences and picture out the key to success, will do more to enthuse and stimulate a man to extra exertion than most anything else I can imagine. Other states have seen and recognized the importance and necessity of such a move. Other states are receiving the benefits and rewards accruing from such an enterprise, and I see no good reason why Missouri should procrastinate longer. The producing classes of this State are just as loyal, just as worthy and law abiding as can be found anywhere, and entitled to as much consideration. Other interests are watched and recognized to some extent.

Our State, through the last General Assembly, appropriated $20,000 to make a geological survey; to dig down into the earth and hunt up new fields of mineral; $5,000 to a horticultural society. I think it commendable for a State to show enterprise and pluck. It is just as commendable in a State as it is in an individual; but I think a State should use her money with the same prudence that we expect of an individual. Of how much more general advantage to the public do you think the $25,000 just mentioned would have been if it had been prudently expended in giving suitable rewards to the producing classes, according to the different degrees of success they have attained?

No prudent man who respects as he should the laws of economy would be willing to make investments of any kind before he had fully considered the outlay and figured out the probable returns of his investment. A man enjoying a public trust and the confidence of his constituents should be doubly cautious how he handles the funds placed at his disposal. Before it would be prudent and right for a State Fair to be established in Missouri or any other State, a fair and accurate calculation should be made as to the probable running expenses, which I have calculated would be met by a small admittance fee charged at the gate; and an appropriation of $25,000 from the Legislature would be an ample sum to be distributed in premiums.

Now another very important question comes up: Would that $25,000 be burdensome to our citizens? According to the last Auditor's report, the taxable property of Missouri was $780,692,245.38, and it would take a tax of .0032 of a mill on each taxable dollar to raise $25,000. Or if a man had property worth $10,000, at the usual way of assessing it would cost him a little less than 11 cents. These are facts and figures, and the way the taxable wealth of Missouri is increasing it would be but a few years until the cost would not be more than 6 cents for a man worth $10,000 to run a State fair, if a direct assessment should be made for that purpose. I know very well that the word "fair" conveys with it to the minds of some people an idea of all that is vile, wicked and immoral. I know more: that there are some fairs in this State that are run without much respect to the laws of morality and decency, and damage greatly those associations that do make some pretensions in that way. I do not think any man would be so unthoughtful as to offer a bill for a State fair without a clause inserted therein, providing that there shall not directly or indirectly be permitted any gambling device of whatever nature operated on the grounds, nor permit any intoxicating liquors, wine or beer to be sold thereon. With these safeguards and moral restraints thrown around a fair, I see no reason why it would not be a proper place for any man to go and take his family; as much so as to a political picnic or a Sunday school convention.

The reason so many of the county fair associations allow immoral games and intemperate privileges sold, is because ofttimes they are poorly patronized and have to use all the means possible to prevent the balance sheet footing up wrong. But if the State will step in and place around it her protecting arm, the morals will be greatly improved. You that have been crying "down fairs" on account of their immoral influences, can now lend a helping hand in establishing one pure enough for any of us.

I wish to say this to my friends who oppose the State fair, if there are any such here, that Missouri is still rich enough, notwithstanding the State tax was reduced one-fourth by the last Legislature, to amply provide for a State fair without any increase in the rate of taxation. The only question is which would be the better plan, to go on in the future as has been common in the past—making more places to put worthless, soft-handed, soft-headed dudes that never produced a single thing or turned an honest dollar in their lives, dusting out the little surplus always left in the treasury for them; or would it be more prudent and statesmanlike to recognize and consider to some extent the claims of him who plows and sows and reaps, and him who shoves the plane and saw, or to make it short, the producer generally? The farmers in Missouri do not receive the recognition from the State they should, and it is their fault, for not standing together. At the last General Assembly an increase of salary was asked for the worthy Secretary of the Board of Agriculture from $600 to $1,200 per year, and it was refused and opposed by many farmer members; in fact, it was really defeated by them. A short time after this it was thought another place could be made for some one to rub up the old guns in the Adjutant-General's office, to be called the Adjutant's clerk, at a salary of $1,200 per year, and many farmers supported the measure.

Why should Missouri have a State fair?

First—Because we are able, and it would be no burden.

Second—Because the producing interests of the State are great, and by adopting a plan that would collect together the best of our products, it would enable a man to there obtain more knowledge in regard to the different kinds of seed and plants, how and when to propagate and grow them, than would be possible to acquire in any other way in the same time.

Third—Because it is the safest place for a man to go for the purpose of obtaining stock to improve his stables, herds, flocks, or his swine, as he can there compare one animal with another. If he can see but one at a time, and be required to carry the form, size and general appearance in his mind's eye, he would be attempting something that but few men are capable of doing.

Fourth—Because other States advertise their resources, and we must, or stand at a great disadvantage.

Fifth—Because the whole State would receive therefrom a substantial benefit.

Sixth—Because it would excite a spirit of emulation and enterprise in our citizens that would be healthy and commendable, which to some extent now lies dormant.

Seventh—Because this is the only way ever devised to encourage the working bee, and at the same time muzzle the blood-suckers and drones.

Eighth—Because a fair supported by State aid would be free from all the gambling devices and liquor-selling that make many other fairs so obnoxious to some of our good citizens.

Ninth—Because it is for and by the whole people.

Tenth—Because the reasons are all in favor and none against it.

AGRICULTURAL FAIRS.

[Presented by GEO. LONGMAN, editor of Colman's Rural World, at the Farmers' Institute, held at Mexico, Mo.

It has been my duty for very many years past to think, to read and to write in the interest of agriculture in all its various departments that I may, if possible, lead the farmers to improved methods and crops, limit their toil, increase their revenues, add to the comforts of home, and the peace, happiness and prosperity of the family, and generally to lead my readers through green pastures of success and by the still waters of peace and plenty. This cannot but be a charming employment to one who is able, out of pure love for his work, to devote his entire time and energy and all of his heart's enthusiasm to it. To me there is nothing more pleasurable or delightful, unless, indeed, it be to travel through the country and witness the outcome of one's teachings and labors, to spend an evening with an old subscriber and his family, and in the course of conversation to learn what he is attempting, what he has done and how many of the comforts of life he and his family enjoy as compared with what was attempted and done and enjoyed by his father before him, and this as the outcome of the teachings of an earnest, enterprising and intelligent press. To succeed in business one must love it — must love it ardently, fervently, and with all his soul and strength, just as he loved his first best sweetheart. Lacking this enthusiasm, he is half-hearted, without grit, enterprise or vim, and very apt to be a failure and do what many others beside farmers frequently do, proclaim their business without profit, involving incessant labor sixteen hours of the day every day in the year, amid the inclemencies of winter and under the burning sun of summer, whilst those in other lines of labor are growing richer and he only poorer as the years pass.

Now you will pardon this one reference to myself, and to my work on the Rural World. It is simply the delight of my life to sit at my desk, and every week to spread before you such a feast of reason and a flow of fresh energy and enterprise as shall make you better farmers and more successful business men. Deride as you may book farming, scientific agriculture and the like, but let me tell you, that when the best farmers in the world have put their practice and experience on paper and given them to the world, they are no more to be sneered at than are your own instructions to your son who is to follow in your footsteps.

You have heard the statement often, I doubt not, that "he who makes two blades of grass to grow where but one grew before, is a benefactor to his race;" but we are not content with doing this nowadays; we want three, five or more; and in the keen competition of man with man, nation with nation, the world over, the study of the economic production of our crops and their increase on the same or a less number of acres is not alone the highest duty of the producer, it is almost his sole and only duty. The study of this all-important work is measurably gathered from individual observation and experience, not your own only, but that of others, and this you cannot get unless by reading the papers devoted thereto, or the more elaborate treatises found in books.

My friend, Mr. Chubbuck, the very efficient Secretary of the State Board of Agriculture, under whose auspices and management these farmers' institutes are held, has invited me to say something to you about fairs—what they are for and why we attend them. He is aware that during the four years he worked with me in the office of the Rural World, this was a matter often talked over and discussed; and you, who have read what has been written in and for those pages, will call to mind how frequently mention has been made of the means and measures necessary to their success. I have never thought we got full value for our money at our so-called Agricultural fairs, and have very seriously questioned at times if the best interests of those concerned were ever thought of by the directors who provided them.

When in the year 1723, now more than 160 years ago, the first association was formed in Scotland, it was called the "Improvers of the Knowledge of Agriculture." From this we gather the canny Scot's idea of utility, both in the formation of the society and the arrangement of the fair. Were we to say that the Audrain County Agricultural and Mechanical Association was formed to improve the knowledge of agriculture, the first question to be asked would be, what agriculture does it teach? It is quite true that our conditions and circumstances differ very widely from those who formed that first association 167 years ago, but it is just as true that we need "improvers of the soil" as much to-day as they did, if not more so. It is true they hadn't the Shorthorn, the Hereford or the Polled Angus, as we have them, and it was a hundred years before the issue of a herd book. They hadn't the sleek, trim Berkshire, the portly Poland-China, or the grand Southdown or Shropshire as we have, and are able to exhibit them to-day. They had no railroads for a hundred years after that time, nor an agricultural paper in all Great Britain, and hardly a book to teach them this man's experience or that man's practice; but they realized the fact that they needed to improve the soil to be able to make both ends meet.

When forty years ago, I first attended the annual show of the Royal Agricultural Society of England, and saw the grand exhibit of stock, I discovered that some one knew how to farm much better than my father did. To see there 200 great broad-backed Short-horns all in a row, nearly or quite as many Herefords, and the cherry-red Devons and Sussex in proportionate numbers, told the farmers of the south of England what their co-laborers in the same great work farther north were doing, and spoke to them in trumpet tones the words "go ye and do likewise." It was an object-lesson that no improver of the soil could forget, and was calculated to send them to their homes to scratch their heads and ponder. And that was the object of the fair. If I remember correctly, that great fair is never held in one place two years in succession, but is held now in the north, then in the south, again to the east, then to the west; but it has by its periodical visitations so stimulated the fair enterprise that similar fairs are now held in nearly every county.

The fairs of Great Britain are among the chief means to be credited with the fine stock found there, and mark you, it is there we get our Shorthorn, Hereford, Devon, Sussex and Polled Norfolk cattle; it is there we find our Berkshire, Yorkshire, Suffolk and Cheshire hogs; there we get our Southdown, Cotswold, Oxford, Shropshire, Dorset, Hampshire and Lincoln sheep and thence came the thoroughbred horse from whose loins sprang our noble trotter, the best horse on earth, besides the Hackney, Cleveland Bay, Yorkshire, Suffolk Punch and English Shire horses. You find no other nation able to supply in quality, utility or value, the same variety of unexcelled stock as England, a nation of renters, whose farmer's chief aim is, first of all to pay his rent, then his taxes, then his tithes, and have left enough to live on.

You will not understand me to convey the idea that stock only is exhibited at their fairs, by no means; all the produce of the soil and of the factory are exhibited much the same as they are at the St. Louis fair, only they are made more of, are held in high esteem. The man who can raise the most turnips to the acre, or the most hay or any other crop comes in for his meed of praise and premium. So the best plowman; the best ditcher or hedger; he whose farm is kept the neatest, and he who on a given number of acres can show the most produce.

If then the fairs of one country have so stimulated the competitive ambition of its people as to enable them to supply the world with breeding stock (and there is no other that we can buy from); if these annual shows are so many object lessons calculated to inspire the zeal and improve the methods of those who attend them to such an extent, as to make it the foremost nation in the world, does it not answer the question, what do we attend fairs for?

We do not knew the value of a single object lesson or its far reaching influence; hence, cannot be too careful how we expend our time and money that they may do the most good, and reach the widest circumference. The boy who is in the habit of seeing fine stock or the finest produce at the fairs will not, if he has any ambition at all, rest satisfied until he has or can produce just as good.

The social feature of the English fair is missed at ours; it is a place where the farmers from all the country round meet, and no such a gathering is complete without an annual dinner and its accompanying speech making. It is here that mind comes into contact with mind, practice with practice, and experience with experience; it is here that the best thoughts of the brightest minds are brought out, and from such meetings much of the good of the fairs comes.

Some ten or twelve yoars ago, you remember, we never used to think of maturing our steers until four years old. It was about the time that we began to ship cattle to Europe. We always wanted to ship the finest and the best, not only because it cost no more to ship a good one than a poor one, but that the meat might compare favorably with the genuine English or Scotch and therefore bring as much money. It was about that time that, in company with an Illinois farmer and breeder and a gentleman from Scotland, who was in this country for the purpose of ascertaining our ability to sustain shipments of cattle to Great Britain, I stopped at the elegant mansion of the Illinois cattle king, the late John D. Gillette, of Elk Hart. We had been shown all over his more than 10,000-acre farm, had seen his cattle, from the calves up to mature steers, had been shown his breeding bulls and 500 cows, and returned to the house for dinner. After dinner all resorted to the veranda to afford the smokers an opportunity for a whiff in the cool shade in the open air. The conversation naturally drifted to the breeding and feeding of cattle for the British market. The Scotchman gathered from Mr. Gillette his method of buying, breeding and feeding. He bought nothing but grade short-horns, and these when quite young. He used only full-blooded short-horn bulls and grade and full-blood cows. His calves were weaned by their dams and never saw a barn. As the animals approached maturity they were herded nearer and nearer to the house, because there were the corn cribs with two or three hundred thousand bushels of corn. The best of the three-year-olds and all of the three-and-a-half-year-olds were herded together and fed each a half bushel of corn a day for six months prior to shipping. The aim was to make them weigh from 1700 to 2000 pounds.

The Scotchman questioned the policy all through. He demonstrated the fact that before being corn-fed, they lived in luxury on summer grass and in poverty in winter; that this was calculated to make the meat sinewy and tough, and that the six months of corn simply laid on a coating of fat that was not wanted, and fat in bunches which was comparatively useless. It was seen that a layer of juicy meat made in summer was covered with a tough, tasteless, sinewy layer made in winter, all of which should be remedied by a system of feeding from weaning time to maturity. Moreover, the steers were kept too long. A 1,400 pound steer well fed could be matured at from 24 to 30 months, thus shortening the time for marketing from one and one-half to two years, and making a more profitable beast, one more in keeping with the tastes of the consumers on the other side of the ocean. The matter was fully discussed, and I am able to say to you that that one lesson changed Mr. Gillette's whole method, and I very much question if he ever fed another steer until he was four years old. A little corn all the time, and the beast matured at an early age, gave him a reputation for fine cattle he never had before, and made him much more money.

I have introduced this one illustration to show how much a man may learn in one simple lesson, and how far-reaching and wide-spreading the influence of one man's example may be.

Now to return to the fairs: we need more cattle and hogs and sheep and horses shown, and much more attention paid to their showing. We need to pay more attention to the exhibition of the crops grown upon the farm, that others seeing our good works may be led into temptation and go and do likewise. Our fairs can be made the means of educating the masses of farmers, and to be a success must do so. We say that farming doesn't pay, but the best of farming pays the best, and we should do that which pays the best; that which is casual and transient is very apt to pass without note or observation, hence be unrecoverable; but that which is forced upon our attention is seen, examined and noted; is fastened upon the mind and is recoverable at any time when the occasion calls for it.

The man who goes to a fair merely for amusement or idle gossip is very apt to return home having learned nothing, whilst he who went with eyes and ears open is more apt to carry with him new ideas calculated to develop new forces and a quickened intelligence. The genius of our day and of our country calls for improvement. In no one department of business can we afford to stand still, much less in that of the show business. What are the improvements made in recent years in the conduct of our fairs? It is true we have gained in a passion for the trotting horse and done well; but is it not at the expense of other and equally valuable departments? The Trotting and Pacing

Horse Breeders' Association of Missouri has done a marvelous amount of good during the few brief years of its existence, and if we had a similar association for cattle, for sheep and for hogs, they could and would each do a similar work. At present we go to the fairs to see such stock and do not find it. The miserable scrub cows which are found all over the State kept by farmers for dairy purpose cost more to keep and to make and market their produce than the produce is worth. We need therefore a show of the best dairy cattle, as the Holstein, Jersey, Guernsey or Ayrshire, of which representative animals may now be had at very reasonable prices. We need a better exhibit of dairy utensils and better buildings in which to exhibit them. You ask me then, "what are the purposes of fairs?" and I reply, they are our teachers; they ought to instruct us in better means and methods, that we might return to our homes and once more try to grow two tons of hay where but one grew before; sixty bushels of corn where but twenty has been the average annual product, and thirty bushels of wheat where but ten or twelve grew before. The purpose of our fairs should be to show us the folly of continuing to grow scrub stock either for meat or butter, for pork or mutton; to prompt us to raise better horses and more of them, instead of the small, ungainly and comparatively worthless stuff sent to market.

We are in the habit of teaching that like begets like, and this is true to a greater extent than many of us are willing to believe. You do not get as good a colt from a stallion whose service fee is $5 or $8 as you do from one whose services are worth $50; but you say you are too poor to pay $50, and have to do the best you can with your money. You buy or breed to an inferior bull or ram or boar on the same statement of facts; but when you go to the fair you see a horse sold by one of the farmers of your county for three, four or five hundred dollars. You see two-year-old steers that weigh more than your four-year-olds, and sell for a much higher price per pound; you see there yearling sheep fit for the butcher, weighing more than your aged wethers, and hogs which at eight to ten months old will turn the scale at 250 pounds, and bring the top price in the stock-yards at any time they are offered. You say you can't afford to do this. Let me tell you that no poor man can afford to do otherwise, and no rich man will. Show me a man that knows the real purpose of our fairs and attends them with that end in view, and I will show you a man whose heart is in his work, and whose enthusiasm is not only seen in the quality of his stock, but whose very soil partakes of his enthusiasm and responds thereto.

I heard of a Missouri farmer but a month or two since who had this poverty scare on him to such an extent that he couldn't afford to pay a dollar a year for the Rural World or any other paper published in his interest, hence had little or no knowledge of what was going on outside of his own little world, and was not alone starving his own mind, but as well that of every member of his family. But that was not all. He was visited by one of those cunning fellows who are ever on the alert to catch the ignorant poor, who, after a short dicker, bought the apples in his orchard for $250, telling him there was a similar abundance everywhere. Within a week the purchaser had sold the apples for $1,200, and the man that bought them realized $1,800 on his bargain, for he sold them in a lump for $3,000. Had that man not felt so poor to spend a dollar for a little book-farming, he would be rich to-day.

Mr. L. A. Goodman, Secretary of the Missouri State Horticultural Society, stated in his address at the annual meeting held at Clinton two weeks since, that the Rural World, by keeping its readers advised of the apple crop, had saved to them hundreds of thousands of dollars, and this became a part of the ten millions realized by the fruit-growers of the State this year.

You are too poor to breed to good sires, then sell what you have and club with your neighbors and buy them.

Whence come the horses that are found in all the great marts of the country, which sell at from $50 to $60 or $70? They come from Missouri farms, are bred and fed for four years by Missouri farmers, and, unless for the service fee, cost them just as much to raise as those which are readily bought up at two or three times the price, and the beeves that sell at the stock-yards at from one and a-quarter to two cents a pound, whilst other and younger cattle bring from 50 to 100 per cent more money. Whence come they but from the farms of men who are too poor to raise better? A good short-horn bull can be bought to-day for $100 and will serve fifty cows a year. The produce of that one cross will mature a year sooner and weigh 200 pounds heavier than your scrub produce.

It is the purpose of our fairs so to show the improved stock of the country as to inspire men with the ambition to possess and to breed something like it. And let me say to you that there is money, good money and good profit, in producing the best, whilst there is no money in coming short of that point. It is the hand of the diligent that maketh rich. There is money in farming, in good farming, in enthusiastic, enterprising work; but there is little or none in ship-shod, haphazard, spiritless work, I care not where it is.

Give us, then, fairs, good fairs—fairs at which the best produce of the finest farms in the grandest State in the Union can be seen—fairs that shall be attactive and bring out the crowd, and that shall serve as object-lessons to both young and old, and form bright spots in their memories ever after, and help in the good work of making the poor richer and the rich no poorer, but all be blessed alike.

THE MISSOURI STATE BEE-KEEPERS' ASSOCIATION.

By request, the Secretary of the State Bee-keepers' Association furnished the following report of proceedings for publication in this report:

SECOND SEMI-ANNUAL CONVENTION.

MARSHALL, MO., April 16–17, 1890.

FORENOON SESSION.

The convention was called to order at 10:50 a. m. by the President, R. B. Leahy.

The proceedings of the Higginsville convention were read and approved.

The Secretary's financial report was read and approved.

The Treasurer's report was read and, on motion, the report was received.

The committee on adulteration of honey, reported by reading section 3879, Revised Statutes of Missouri, 1889, relating to adulteration of food and drinks.

On motion, the report was received and the committee discharged.

The following letter from the Secretary of the International American Bee Association, was read:

HAMILTON, ILL., March 19, 1890.

J. W. ROUSE, DEAR SIR—I take the liberty of writing you to ask you to place before the meeting of the Missouri State Bee Association the question of affiliation with the International, at their coming meeting of April 16th.

You are probably aware that the International American Bee Association meets in Keokuk, Iowa, next winter, and we are very anxious to have a representation of all bee associations in the country to unite with us and consider the quesoion of representation at the World's Fair in 1892, as well as the interests of the bee fraternity in general. We have already succeeded in getting the affiliation of the Ontario (Canada) bee keepers, the Wisconsin State, the Ohio State, the Southwestern Wisconsin, and we have the promise of affiliation from the New York State for their next meeting.

We will call your attention to the fact that by affiliation your President becomes ex-officio Vice-President of the International Association, and each of your members enjoys the privilege of attending the meeting of the International without having any fees to pay. You will greatly oblige me by bringing this subject before your meeting at your next session, and informing me of the result afterward.

I send you by this mail a copy of the Columbus report containing the rules on the subject of affiliation, and also a copy of the Brantford meeting for perusal.

The World's Fair of 1892 will undoubtedly bring a number of European apiarists to our shores, and we must be able to show them that America leads tha world in practical bee-keeping as well as in many other things. If it was but for this question of patriotic pride, we should unite to achieve it, but there are many other advantages that can be derived from a grand union of the bee men of America.

Trusting to hear from you favorably, I remain yours truly,

C. P. Dadant.

The proceedings of the convention were suspended to give an opportunity for any who desire to become members to join. The following were enrolled after roll-call, to which nine old members responded :

J. H. Jones, Buckner,
J. B. Spedy, Boonville,
Oliver Rouse, Santa Fe,
A. Brengarth, Clark's Fork,
John Elliott, Green Ridge,
R. L. Lewis, Warrensburg,
W. S. Dorn Blaser, Higginsville,
John Nebel, High Hill,
Ulysses Adams, Missouri City,
John Young, Marshall,
H. Martin, Ashland,
Samuel Whanger, St. Aubert.

On motion, Mr. and Mrs. Robt. Sandidge, Marshall, were made honorary members.

The question of affiliation with the International Association was resumed, the Secretary reading the rules and conditions of affiliation. Pending action, a recess was taken to 1 o'clock p. m.

AFTERNOON SESSION.

The convention was called to order at 1:30 oclock.

H. C. Williams and H. W. Campbell, of Marshall, were enrolled as members.

The discussion on affiliation with the International Association was resumed, Vice-President G. P. Morton in the chair.

Moved by Messrs. Leahy and Rouse, that this convention accept the proposition of the secretary of the International Association and vote the fees necessary to affiliate. The motion prevailed.

Moved that the amount be raised at once by special subscription.

R. Gaines Robertson offered amendment, that the taking of the subscription be made the special order for Thursday at 1 o'clock p. m. The amendment prevailed.

The following essay, by James Hedden, of Dowagiac, Mich., was read :

SHOULD ANY PERSON SO DESIRING KEEP BEES?

Brother bee-keepers of the Missouri State Bee-keepers' Association, in convention assembled: I thank you for your kind invitation through your worthy Secretary to be with you at this meeting, and assure you I would be, no doubt, more pleased than you yourselves could I attend, but it is impossible for reasons which you, no doubt, fully realize.

"Should any person so desiring keep bees?" Most assuredly they have a legal and moral right to keep bees if they desire, and no one should try to prevent it by any law, or by boycott, enmity, jealousy, ill-feeling or ill-treatment or anything of the kind. This is a free country, and every brother has a right in the broadest sense of that term to pursue any calling he may see fit. Where one has located and fully stocked a honey field, perhaps there are cases where it will hardly be morally just right for another to put bees in that field, but the wrong is based upon the fact that such condition would be detrimental to both parties, the one fully occupying the field and the newcomer as well. Supposing it to be right, both legally and morally, how we do detest servile imitation! How we dislike the old rooster who stands looking around, idle, until he sees some chicken unearth a worm, and then steps in and gobbles it, or tries to! But fortunately, in the nature of things, the imitator has not brains enough to compete with him who discovers an unoccupied field for honest production, and has a good start in that field. If there is any bee-keeper here to-day who is trying to raise honey in a field previously well occupied by another, I beg of him to desist at once. On behalf of his own interest do I urge him to seek an unoccupied field. Get six miles away from any other bee-keepers who possess any considerable number of colonies. This is none too far in ordinary localities.

"Should any person so desiring keep bees?" Perhaps you mean, should he undertake it as a financial investment? That all depends. Every person should not, even if they desire it. More than one-half of mankind has desired to do things, and a large majority of that half have done that, which, for their own interest and that of those with whom they come in contact, they should never have done. This is just as true of bee-keeping as of other pursuits.

Right here I will stop and await with pleasure the covering of the rest of the ground by the discussions which follow. I know that long essays are the death of conventions. Hoping I have said something which will be used as a groundwork for the unraveling of the problem by the intelligent bee keepers of your sunny State, I remain, Your co-worker among the bees,

JAMES HEDDON.

Discussion of the essay followed:

J. H. Jones—Believe that a man has to be adapted by natural gift for the business, love it, never tire to talk of it or be afraid of bee stings.

The Secretary modified the question thus: Is it profitable for any body or everybody to keep bees?

R. G. Robertson—Any one who is not so nervous as to fight the bees when they come about them. Fighting the bees will cause them to sting family and stock. Some men are born bee-keepers, some are made. Some are not born and never can be made such. A man ought to have a fancy for it and study it to make it profitable.

P. Baldwin—My experience is that many farmers have not the time to give bees the attention they need, and when their bees fail, often claim robbery on the part of others.

H. C. Williams—Believe that many should be discouraged from keeping bees, for their own good. If they take the improved hive and make a close study of the business, it would be well enough for them to keep a few.

G. P. Morton—Opposed to any in the business unless they expect to make a close study of it. Lack of study and application causes too many failures; also causes honey to be brought to market in inferior shapes, depreciation of market and prices.

R. B. Leahy—The question is, should this convention recommend any one to keep bees who so wishes. Everyone who raises bees as a business knows that all bee-keeping as a side issue is a detriment to the business, runs down the breed, keeps prices down, etc. The side-issue man is never with us in improvements of any kind, and what they sell at we have to. Side-issue men say they don't care if they don't raise much honey. Such men are a detriment to any business and had better keep out of it. Think new beginners who want to learn and make a business should be encouraged.

The President—The question of adulteration of honey was not disposed of this morning. It is now before the convention.

The Secretary read the following essay, by Dr. C. C. Miller, of Marengo, Ill.:

"WHAT MEASURES SHOULD BEE-KEEPERS TAKE AGAINST THE BOGUS HONEY BUSINESS?"

As this paper is merely intended to open discussion, I will make it suggestive rather than attempt to treat it fully. The discussion of members will bring out more fully the particular local phase of the question, and in that way the proper steps to be taken may be discovered more fully than can be done by one not fully informed.

I suppose the bogus honey under discussion to be adulterated extracted honey. One of the first questions occurring is, how much adulteration is to be found? I had supposed not so very much of late, as the statement has been frequently made that honey is now so low and glucose so high that adulteration is not profitable. Stringent laws against the adulteration of all food products are eminently proper, and may do much good. Without saying what may be the best means to drive out adulteration, let me suggest one means within the control of bee-keepers that is too much lost sight of. A good many years ago, when I was young in the business, some honey that I put on the market was objected to on account of its quality. I stubbornly defended it, taking the ground that "honey is honey," and that this was a pure article just as it came from the bees. This was very true, but it was also true that however pure it might be, it was a very vile article in smell and taste. As nearly as I can remember at this distant time, it was a very dark and very ill-tasting sample of plant-louse honey, withal somewhat soured. Instead of withdrawing it from the market, I left it till all was sold out, and I suspect my home market is poorer to-day in consequence. I surely think I educated a number of people that honey was or might be a much poorer article than they had supposed.

Now if I was allowed to sell such an article, why should not a good article of glucose with a better taste and a better appearance be sold, always providing it be sold under its real name?

If on the other hand a customer has never tasted any but the best quality of honey, will not his taste thus educated be a pretty good safeguard against the purchase of an adulterated article? I don't think I can tell by the taste whether a sample of honey is pure or not, can you? But I can tell whether it is a real good article, and so can you. Can't you distinguish between an adulterated and a pure article, provided the latter is of the very best quality? And suppose all your customers are as well educated as you, how much bogus stuff will they buy in the presence of A1 pure honey?

Now how much of the extracted honey that is sold is just as good as it can be made? Have not you, and you, and you, sold extracted honey that was more or less sour? I venture the guess that more than half the extracted honey on the market is more or less sour.

If I am correct, then there would be at least a heavy blow given the bogus business by seeing that every drop of honey put on the market is thoroughly ripened, and if any of it is a little off in flavor, let it be graded accordingly and not sold for table use.

R. Gaines Robertson—Believe that when we find a merchant keeping bogus honey for sale we should analyze it and present, and if necessary enforce the law to stop the sale. But if we all co-operate in all counties, we can have such influence with local merchants that this will not be necessary.

H. C. Williams—The law refers to those who adulterate, not those who sell. The adulterator may be beyond reach.

L. W. Baldwin—If we had a law to reach the merchants who sold it, it would kill the sale of extracted honey. Merchants lack experience to distinguish between pure and impure honey, and would not run the risk.

J. H. Jones—The adulterators might be traced through the merchants.

J. W. Rouse—But if the adulteration takes place in another state, we can't reach him.

J. H. Jones—Not unless that state has a similar law.

R. B. Leahy—The trouble will be in securing conviction of the guilty parties. Not only adulteration, but fraudulent adulturation, must be proven. It is hard to find a pound of strictly pure honey. In the best of seasons pure nectar does not come in. Bees will gather sugar from decayed fruit, grapes, apples, watermelons, peaches, etc. What we are after is the half glucose stuff.

J. H. Jones—I think we should take some definite stand on the question and send a solid word against adulteration.

Moved by P. Baldwin and R. Gaines Robertson, that a committee of three be appointed by this association to draft resolution expressing the sentiment of this convention as to the adulteration of honey.

G. P. Morton—Would it not be well to call on Congress for a law through the International Association?

R. B. Leahy—We ought to get other local and State associations to co-operate.

Amendment offered to the motion: "That a copy of the resolution be forwarded to other associations and an effort made to secure their co-operation in making it a national question."

The motion prevailed as amended.

The President appoints as such committee: P. Baldwin, R. Gaines Robertson and G. P. Morton.

A general discussion followed, in which the convention paid its respects to local papers and editors.

H. C. Williams—What is the best manner for spacing an apiary, how far apart to put the hives, how to face them, and should they all face the same way? Should they be shaded, and how much?

J. W. Rouse—My apiary is located on a hill-side, running to west, bear south. Hives are leveled on stakes, spaced eight feet from center to center of rows, with two rows about eight inches apart. Very little shade. Hives all face east.

John Nebel—My experience is that all hives should face east, rows ten feet apart and hives five feet apart in the rows. Hives facing east are least liable to suffer from winds.

R. Gaines Robertson—How would southeast do?

Mr. Nebel—Very well.

J. S. Atkins—Have been keeping bees since 1875. Have my apiary in orchard, hives facing any way. In winter my bees come out best with hives facing south. Have all facing south in winter. In summer I do not see any difference as to facing.

H. C. Williams—How much lower should the front of the hive be than the back?

J. Nebel—Enough to let the water out.

G. P. Morton—I find that hives facing south do the best. I use hive shades and have more trouble from the east and west than the south sun. Think spacing immaterial. Aim to set hives level, with from one-quarter to one-half inch lower in front. Do not want permanent shade. Think it detrimental to the work of the bees.

L. W. Baldwin—I have two apiaries, one facing south and one east, and find no advantage in one over the other. Would not want them facing west or north. I space them far enough to work. According to twenty years' experience, I find a hive in the sun does as well as in the shade. I think shade boards are a nuisance. For best shade, I like small fruit trees trimmed up so as to give room to work under them.

J. H. Jones—Have my apiary partly open and partly shaded. Don't find any benefit in shade but to myself. Thickly-shaded hives swarm as early and quick as those not shaded.

Henry Tickemyre—How do you get the bees out of trees when they swarm, without cutting the limb?

L. W. Baldwin—Have a box with cloth cover; carry the box up on a ladder under the swarm and shake the bees into it, then cover. Take it down and set in shade five minutes until the bees are quiet, then hive.

Short discussions on fertile workers and introducing queens followed.

Moved that the President appoint a committee of four to meet at 7 o'clock and prepare a program of subjects for the night and second day's sessions. Carried.

Moved that a question box be established, and that the President appoint a committee of three to answer the questions in the box. Carried.

The President appoints as committee on program, L. W. Baldwin, G. P. Morton, R. G. Robertson and E. B. Gladish; as committee to answer questions, P. Baldwin, J. Nabel and J. H. Jones.

Eleven o'clock of second day was fixed as the hour for opening the question box.

W. H. Allison, Marshall, and H. B. Tickemyre were enrolled as members, after which a recess was taken to 7:30 o'clock.

NIGHT SESSION.

The convention was called to order at 8 p. m.

Letters from Andrew Finlayson, Carrollton; F. H. Petts and J. J. Hart, Warsaw, and G. H. Ashworth, Sedalia, requesting membership, were read and the names enrolled. The letter of G. H. Ashworth was accompanied by a model of a queen cage designed to prevent swarming, which was shortly discussed.

The committee on program reported, and the following question was read for discussion:

"What is the best plan of management in spring to get the bees ready for the honey harvest?

P. Baldwin—What is meant by "best?" Every man has the best way. I know of no better way, if colony is in good condition, than to give all the food necessary; have plenty of honey and sugar in the hive.

R. B. Leahy—Would you recommend having your winter stores added to as they run out, or would you give plenty to run?

P. Baldwin—Would give plenty to run to middle of April, but if feeding sugar, would as soon put in enough in September to last to the clover season.

G. P. Morton—Do you think it enhances the value of the hive to have it well protected?

P. Baldwin—It has no effect on spring management.

J. Nebel—A bee-keeper ought to tell first about fall management. If the bees are properly prepared in fall, have plenty to eat, and the brood nest is contracted, they do not need so much management in spring. I contract the brood nest by putting in division boards. After taking from cellar we see that they have enough honey, and sometimes put in extra honey reserved for the purpose. We don't spread brood now as we used to. We found that spreading was no benefit. We give them attention until they are sufficiently strong to gather honey.

P. Baldwin—Would you feed night, morning or mid-day?

Mr. Nebel—In order to prevent robbing, would feed in the evening.

A member—Why every evening?

Mr. Nebel—It keeps them stronger to feed in small quantities and makes the queen lay faster.

P. Baldwin—I would like to have my friend Jones explain some of his weak colonies.

J. S. Atkins—My experience is limited as to feeding. I examine my bees, and if they have plenty of food to carry them to the blooming season I do not bother them. If they have not enough I feed them daily.

J. H. Jones—I see that my bees have plenty to eat and run in everything that will build up. In spring I generally tear down all weak colonies to strengthen the others. I go through the apiary and mark all I wish to tear down and those that need strengthening, then scatter the frames of the weak ones among the other colonies, and provide each colony with a good queen.

J. W. Rouse—When do you tear them down in this way?

Mr. Jones—Just as the honey flow commences.

A member—Do you have any trouble by having the bees thus introduced killed by the others?

Mr. Jones—No.

G. P. Morton was called upon to condense the discussion.

Mr. Morton—Ascertain if we have weak colonies needing dressing; strengthen the colonies by tearing down the weak; supply plenty of food, and see that queenless colonies are provided with good queens.

The second question reported by the committee was read as follows:

"Is it desirable to prevent increase to secure a larger crop of honey."

The President—I suppose anyone would answer 'yes.' I would suggest that the question be amended by adding "and if so, how can we prevent increase?"

L. W. Baldwin—It has been the great object to keep down increase, but so far I have found nothing to suit. Have tried queen cages and destroyed cells; it resulted in having the queen killed when liberated.

R. B. Leahy—I have tried many plans and become disgusted. One plan will work one year but will not the next. I now aim to get one good swarm, then cut out all queen cells but one, and reduce in the fall.

P. Baldwin—Swarming is a natural law we cannot overcome.

J. H. Jones—The year 1886 was a great honey year and many of my colonies did not swarm that year. My experience was that there is no difference in swarming and non-swarming colonies as to raising honey.

L. W. Baldwin was called upon to condense the discussion.

Mr. Baldwin—It is the nature of bees to swarm; it is impossible to control; make the most of it when they do swarm; cannot make a financial success in endeavors to control; take advantage of all opportunities to keep the stock down.

Adjourned to 9 a. m., April 17.

FORENOON SESSION.

The convention was called to order by the President at 9 a. m.

Milton Cone, Chillicothe; J. W. Clark, Clarksburg, and E. Larabie, Tina, were enrolled as members of the association.

Discussion on questions reported by the committee on program was resumed, and the third question read, as follows:

"Does it pay to use full sheets of foundation in the surplus boxes?"

After discussion G. P. Morton was called upon to condense.

Mr. Morton: Enough to guide the bees is all that is needed.

The fourth question was read as follows:

"Does it pay to use full sheets of foundation in the brood chamber?"

After a general discussion it was moved that the question be decided by a vote of the convention. The motion prevailed.

The vote was: In favor of full sheets, 9; opposed to full sheets, 1; other members were excused from voting on account of insufficient experience.

The fifth question was read as follows:

"Is it best to use a queen excluder over the brood chamber?"

The matter elicited in the discussion was condensed by J. H. Jones.

Mr. Jones—For comb honey have no use for excluder; no trouble from queen going into boxes; don't think bees like to work as well through zinc as through open space.

H. B. Tickemeyer—How can I make bees work the upper story?

R. G. Robertson—By putting drones up.

The hour for opening the question box having arrived, the committee reported as follows:

Q. What is the best plan for contracting the brood chamber? A. By close-fitting division boards.

Q. Is it practicable to supersede queens at two years old or near so? A. No; let nature take its course.

Q. Which is most easily handled, open or close top bar frames? A. Close.

Q. How prevent pollen in the surplus boxes? A. No remedy.

Q. Are bees taxable property? A. By common law they are.

Q. Is it not possible to control swarming by use of tenement hives, with queen-excluding honey boards and a surplusage common to all? A. No experience.

Q. What is the best way to get bees out of surplus boxes? A. Smoke them.

Q. What advantage have hives with bee space on top over those with bee space underneath? A. None.

Q. Would it not be possible to prevent increase by the use of tenement hives (four in a bunch) and a surplusage common to all? A. No experience.

Q. What is the best plan to prevent second swarming? A. Cut out all queen cells but one.

Q. Has anyone acquaintance with a bee escape? A. Keep unclipped queens and let them go to the woods.

G. P. Morton explained a late invention known as a "bee escape," used to allow bees to escape from the upper to the lower story and preventing return.

Q. What is the best mode for introducing queens? A. Remove the old queen and introduce the new, liberating after forty-eight hours.

Q. What is the best plan for building up colonies in the spring? A. Give plenty to eat.

Q. Should one bee-keeper conscientiously undersell another in order to get rid of his surplus? A. No.

Q. How can we secure better prices for honey? A. Put in best marketable shape.

Q. Has any member any experience with a swarm catcher to attach to hive? A. No experience.

Recess to 1:30 p. m.

AFTERNOON SESSION.

The convention was called to order at 1:45 p. m.

Wm. Bledsoe, Pleasant Hill, was enrolled as a member.

The question of affiliation with the International Association having been made the special order for this hour, a collection was, on motion, taken up to pay the membership fee of $5. The collection netted $5.

The committee on resolutions reported as follows:

Whereas, it is known to this Association that extracted honey is largely adulterated with glucose and grape sugar, and that in our opinion the practice is damaging to the producers of honey in this State, and a fraud on the general public: therefore be it

Resolved, That this Association does emphatically denounce the practice of adulterating extracted honey with glucose or grape sugar;

Resolved, That we urgently request the Bee-keeping Associations of the different states, and others, to co-operate with us in presenting this subject to the consideration of the International American Bee Association that they may memorialize Congress to pass laws regarding the matter.

Resolved, That a copy of these resolutions be sent to each State Bee-keeping Association and others.

It was moved that the resolutions be adopted and placed on the minutes and the committee discharged. The motion prevailed.

Hon. J. V. Chase, mayor of the city of Marshall, was introduced, and delivered an address of welcome.

It was moved that the Secretary be instructed to send the resolutions to the secretary of each state association with a request to receive their answer, and report the answers at our next meeting. The motion prevailed.

It was moved that thanks of the Association be extended to the sheriff and other officers of the county for kindness in furnishing the use of court-room, etc. The motion prevailed.

Moved that the association authorize the executive committee to have the minutes printed. Carried.

On motion, the question of selecting the place for next meeting was taken up. Mexico was named by J. Nebel, Boonville by G. P. Morton, and Appleton City by R. B. Leahy. The vote was taken by ballot and resulted: Mexico, 12; Boonville, 10; Appleton City, 1. On motion of G. P. Morton and R. G. Robertson, the vote was made unanimous for Mexico.

Moved, that the next meeting of the Association be held three days. The vote on the motion was by ballot, and resulted: in favor of three days, 4; two days, 18.

Moved, that the next convention be held in the latter half of October. Carried.

G. G. Bennington, Slater, and J. C. Reynolds, Miami, were enrolled as members.

Pending adjournment, the following statistics were gathered:

Name of owner.	Manner of wintering.	No. of colonies		Condition.
		Fall.	Spring	
R. B. Leahy	Cellar and out-doors	70	67	Good
J. W. Rouse	Out-doors	83	78	Fair
G. P. Morton	Out-doors in chaff	21	18	Fair to good
R. G. Robertson	Out-doors in chaff	22	22	Good*
J. H. Jones	⅔ in cellar, ⅓ out-doors	191	169	Fair
J. B. Spedy	Out-doors	76	74	Good
L. W. Baldwin	Cellar	300	205	Fair to good
J. S. Atkins	Out-doors	84	79	Fair
M. B. Robinson	Out-doors in chaff	62	62	Good†
P. Baldwin	Out-doors	125	123	Good
A. F. Sanger	Out-doors in leaves	7	7	Good
John Nebel	Cellar	262	258	Fair
U. Adams	Out-doors	52	45	Fair
A. Brengarth	Out-doors in chaff	12	12	Good
John Young	Out-doors	9	9	Very good
H. C. Williams	Out-doors	41	38	Fair to good
H. W. Campbell	Out-doors	25	25	Good
W. H. Allison	Out-doors	21	21	Good
J. W. Clark	Out-doors	78	76	Fair
E. Larabie	Cellar	140	140	Fair to good
W. L. Baldwin	Out-doors	150	145	Good
Ernest Baldwin	Out-doors	100	95	Fair
G. G. Bennington	Out-doors	8	8	Very good
J. C. Reynolds	Out-doors	41	41	Good

* One queenless. † Three queenless.

THIRD SEMI-ANNUAL CONVENTION.

Mexico, Mo., Oct. 22-23, 1890.

AFTERNOON SESSION.

The convention was called to order at 2 o'clock p. m., by the President, R. B. Leahy.

The minutes of the Marshall convention were read and approved.

The following new members were enrolled:

J. M. Haley, Bevier,
J. N. Rosser, Rush Hill,
Wm. Davis, Slater,
Byron Iiams, Worcester,
S. C. Hale, Laddonia,
T. A. Pew, Middletown,
L. C. Cheatham, Hatton,
J. W. Bradley, Hexton,
John R. Rhodes, Slater,
E. C. L. Larch, Deer Park,
W. E. Thompson, Laddonia,
A. O. Calhoon, Victor,
R. McDow, Ashland,
A. M. Creel, Grand Pass.

The Secretary's report was read and, on motion, received.

The President delivered his annual address as follows:

Fellow Bee-keepers and Friends: It devolves upon me as your President to deliver to you what our by-laws call the annual address. I am somewhat at a loss just how to frame this address, but after I am through you will, perhaps, pardon me for short-comings and endeavor to bring out in the discussions to follow what I omitted.

This association is now one year old and we have fairly launched upon the sea of life, hoping that our voyage may be prosperous, and that this noble new industrial ship may frequently enter harbor with overflowing cargoes of nectar. This is not the first association in this State of like character, though its predecessor was different in many respects. It was different in that it embraced a smaller territory than this; it was held at one place, and its members from a distance soon grew tired of making a long pilgrimage to its annual meeting point, and those near its established seat equally soon grew tired of playing its footstool; it did not increase in membership, was moved to Kansas City and there it died, with some three or four members holding a wake over its remains. It has been buried three years.

One year ago we organized the present association at Higginsville, and this body has started forth with every promise of success before it. At its first meeting some twenty members were enrolled, and at Marshall last April as many more were added. Profiting by the experience of predecessor, its conventions can not be held twice in succession in the same town, thus enabling many bee-keepers to attend its sessions without having to travel a long distance to do so. Other advantages are derived under this rule, among which I might add the fact that it does not devolve upon one set of men to carry the association on their shoulders. Its meetings are held semi-annually, giving us an opportunity twice a year to compare notes of the past and indulge in interchanging ideas for the future.

Our last convention was held in the city of Marshall. It was successful, instructive and profitable. New and old ideas and methods were discussed and examined, and each left with the proud conviction that the intercourse with his fellows had been one of profit as well as pleasure.

The question of adulteration of extracted honey has been most prominently before this association since its inception. It is a question that interests us all to a high degree, and it is a question that concerns two classes of people, viz.: bee-keepers first, and the people at large second. If we do not agitate the question no one will do it for us, and it behooves us to hammer away at it until every drop of glucose stuff is driven from the market. At the Higginsville convention one year ago a committee was appointed to examine the law on the matter, and it reported at Marshall by reading the law governing the adulteration of food and drinks. A committee was then appointed to draft resolutions on the subject and it presented the following report:

Whereas, it is known to this association that extracted honey is largely adulterated with glucose and grape sugar, and as in our opinion the practice is damaging to the producers of honey in this State, and a fraud on the general public; therefore be it

Resolved, That this association does emphatically denounce the practice of adulterating extracted honey with glucose or grape sugar.

Resolved, That we urgently request the Bee-keeping Associations of the different States, and others, to co-operate with us in presenting this subject to the consideration of the International American Bee Association, that they may memorialize Congress to pass laws regarding the matter.

Resolved, That a copy of these resolutions be sent to each State Bee-keeping Association, and others.

The Secretary was instructed to request a reply to these sentiments from the associations to which he sent these resolutions. What these are the convention knows from the Secretary's report. With this resume as to what this association has done in this matter, I would again say, do not let it rest here.

The statistics gathered at the Marshall convention showed satisfactory and encouraging prospects for the season. Reports were received from 1960 colonies fall count, and these had been reduced to 1909 colonies, spring count, a decrease of about 3⅔ per cent. This was a very good report, but the dry season greatly damaged the honey crop, which in many localities was only 50, and in others 33⅓ per cent of what it should have been with a good season. But this partial failure has many advantages. It resulted in securing a better price for honey, and placed or forced on the market much old honey, thus cleaning the store-houses of the producers, and opening the market for fresh goods next season. The late rains we had, and the encouraging growth and hardihood of honey-producing plants, and especially white clover, during the past few months, have all inspired newh opes and confidence for a large crop next year. With these matters before us and the recollection that it is not all sunshine and success in any other industries, bee-keepers have, in any opinion, little room for complaint.

Since I have but a few hours to serve as your President, I do not wish to enter into a number of recommendations for the future action of the association, but will leave them for my successor. Yet there are a few things I wish to call to your attention.

I would recommend that every member of the association invite and urge his neighbors to attend the session of the convention, and especially those who adhere to the old box hive. It is here where the methods of practical bee-keeping are discussed, and there is no better plan to break up the box hive and side-issue business than to introdûce their advocates to the methods and devices here presented and discussed.

The successful business man, no matter what line of industry may hold him, is continually alert for new devices, appliances and methods for pushing the trade or profession in which he is engaged. These devises and methods are carefully examined, and if they do not prove either labor-saving or money saving, are given a wide berth. If the bee-keeper desires to make a success of his chosen pursuit, he must be equally alert, and not only carefully examine the new methods, devices, appliances and ideas presented, but put all the push and energy he can command into the business, watch every opportunity and take advantage of every point gained. Every box-hive and side-issue man who can be converted into the cause is a point gained for the uplifting of the business and better prices. I say converted into the cause, because you can bring nine men to adopt the improved methods and devices where you can drive one out of the business.

There are a few characteristics for the bee-keeper who wants to succeed to note and develop. These are necessary to his success and should be cultivated with every opportunity. The first of these is morality. This is necessary in any pursuit, and if you will look about you you can readily perceive that fifty moral men succeed where one immoral one does. But in bee-keeping it has a peculiar influence not felt elsewhere, and coupled with patience, the two elements make a first essential, which if lacking will alone cause failure. Without patience, as we all know, the handling of bees is dangerous, and where morality does not exist patience is apt to be lacking.

Add to these two characteristics industry and perseverance, cast them in one mold and you will produce a being who will make bee-keeping a success.

An organization made up of such men can accomplish a wonderful amount of good, not only to their cause but the people at large. Of such men, I take it, this body is composed, and success is certain if we grasp it. But to make it a success every member must bring into display the qualities I have named, enter into hearty co-operation with his fellows, cultivate a brotherly feeling toward one another, stand united and work for the interest of each other. In this way we can develop an association which will not only accomplish great good, bnt in which the social and instructive features are worth many times more than the effort has cost us.

Moved by Morton and Robinson to suspend the rules and take up a proposed amendment to constitution. Carried.

G. P. Morton offers amendment to constitution, viz.: to amend article 6, so that convention be held annually instead of semi-annually and three days instead of two days.

The amendment was lost.

The election of officers was taken up as the regular order.

For President, R. B. Leahy was nominated by Mr. Haley; John Nebel by Mr. Leahy; P. Baldwin by Mr. Nebel, and G. P. Morton by Mr. Robinson.

Moved that if either candidate failed to get majority of votes cast, the candidate receiving lowest number of votes be dropped on succeeding ballot. Carried.

The first ballot resulted: Leahy, 10; Nebel, 3; Baldwin, 3; Morton, 7.

The second ballot resulted: Leahy, 11; Nebel, 2; Morton, 7.

Mr. Leahy was declared elected, and, on motion, the election was made unanimous.

A communication from John Kranz was read in a pleasant strain.

G. P. Morton was elected Vice-President for Central Missouri; J. S. Atkins for Northwest; John Nebel for Northeast; E. R. Garrett for Southwest, and J. W. Clark for Southeast Missouri by acclamation.

J. W. Rouse was elected Secretary by acclamation, and R. Gaines Robertson Treasurer.

Moved that question-box be established on same basis as at Marshall convention. Carried.

Moved that members be given the privilege to discuss questions in box. Carried.

The President appoints Nebel, Baldwin and Atkins as committee on question box.

Moved to use question in box as programme. Carried.

The prepared programme was taken up as the regular order.

"Should bee-keepers encourage the patenting of bee fixtures?" Opened by J. W. Rouse as follows:

BROTHER BEE-KEEPERS—I hope I am only expected to open this subject for discussion.

It is our opinion that bee-keepers should not encourage the patenting of bee fixtures. While we will admit that there are many fixtures used that bee-keepers could not afford to do without, even should they cost double their present price (as a patented article always costs more, if not double, than it would if not patented), still we must enter a protest on patented fixtures, and will give reasons for our opinion.

In the first place, if all bee fixtures were patented that are now used, there would be a great many less bee-keepers on account of the increased cost of fixtures.

It may be possible that some would not count this a great calamity, but if this idea should be carried out in all the productions of the land, we think it would be a very great calamity.

Again, there is scarcely any fixture of any kind now used that is the invention of any one person, but is a combination of two and sometimes of many more persons' invention.

While there are now some patented fixtures, the royalty on them prevents their general use more than those fixtures not patented.

Besides these reasons, a great many more might be given against the patenting of fixtures, but we believe these are sufficient to open the subject for discussion, but will farther add that in all of our intercourse and experience with bee-keepers, we have always found them of a very liberal mind and communicative of bee knowledge.

We remember when we first started in the business of visiting a noted bee-keeper, now a member of this association, and while he found us very inquisitive, he answered all of our questions, and gave us a great deal of valuable information besides, and, in addition to all that, lodged us while there free of cost to us, and treated us to the first honey we had had for quite a while.

We have ever endeavored to carry out this same liberal spirit since then, except on one occasion, and that was when a patent-right man lodged with us we charged him for it, but have since repented of our action, as we learned that he was a victim of another patent-right man, and if he should ever have occasion to visit us again we hope to treat him more liberally.

We do not wish to be understood that patent-right men are not liberal-minded, because we have some grand men in our ranks that have patents. But our intercourse with each other, and our conventions and bee literature, all seem to us to be in a different than the patenting spirit.

J. Nebel—I never believe in patents, and especially on bee fixtures. They are generally impractical. Some fixtures we could not do without even if patented. I have some patented hives, but do not want them for Italians. They may do for blacks. Most patents are not practical, and I am opposed to patent fixtures.

G. P. Morton—While I feel more or less of an inventive turn and favor patent rights, believing that patents have been a great incentive to improvement, I am opposed to patenting bee fixtures in general. It would raise the price of fixtures if loaded with a patent, necessitate the sale of territory and thus limit the inventor himself as to territory. A small article, such as a smoker, will do well enough when patented, but, as a general rule, a patented article in bee fixtures nearly always goes into obscurity. Hedden's hive is loaded with a patent, making it very expensive and beyond the reach of most bee-keepers. A patent concern cannot be changed without renewing or vitiating the patent.

J. W. Rouse—I don't know that I entirely oppose the patenting of some articles. Patents would keep us from manufacturing many articles.

J. M. Haley—An inventor ought to have compensation for his invention, and bee-keepers ought to be willing to pay something for using them.

Mr. Pew—I never saw a patented hive of any account.

R. B. Leahy—It may look strange to look at these ideas from a business standpoint. When I first started I used the Simplicity hive. I make a hive of my own, and there may be something about it which I might patent, but when the idea occurs, it is accompanied with the thought, "You sneaking devil." There the idea stops. There is something wrong about patent hives, and are generally the production of some person who knows little or nothing about bees.

H. O. Calhoun—We ought not to encourage patent bee fixtures unless of marked merit and sold cheap.

G. P. Morton was called upon to condense the discussion.

Mr. Morton—So far as the discussion extended, it was in opposition to the patenting of bee fixtures in a general way. A few fixtures, when made cheap, might be patented.

EVENING SESSION.

"Which is the most profitable to produce under the present market prices, comb or extracted honey?"

Mr. Larch—It depends on location. In many localities we sell little extracted honey and comb honey sells readily, and *vice versa.*

Mr. Nebel—Every year is not alike. When honey is scarce extracted honey sells readily. When we have a good year farmers sell too cheap—ten cents in trade. In that condition of the market practical bee-keepers lose. It depends also on locality. I run both ways, and can raise twice as much extracted as comb honey, consequently the extracted pays me best.

Mr. Leahy—I want to bring out a few points that should not be overlooked in this discussion. There is a good deal in what a man is adapted to. I never did like to handle comb honey. We must have nice, white, clean sections for comb honey. In a poor season many are only partially filled; no bee-bread must be in them; they are expensive to ship; the sections and starters add to the expense. With extracted honey it is different. Less care is required, less trouble, less expense in shipping, and the combs can be used again.

Mr. Morton—I arranged six colonies for the extractor; five of them produced 100 pounds honey in thirty days. From sixteen colonies I got 900 pounds honey, of which 550 pounds were extracted. I can sell twice as much extracted as comb honey.

Mr. Pew—I think there is more money in producing extracted honey in my locality. I can sell ten pounds extracted to one pound of comb honey, and the extracted is easier to produce.

Mr. Atkins—We turn all our attention to comb honey, and where I sell one pound of extracted I dispose of 500 pounds of comb honey.

Mr. Calhoun was called upon to condense the discussion.

Mr. Calhoun—As I understand it, the sense of the convention would be that the production of extracted honey is the most profitable.

"What are the relative merits of the races of bees amongst us?"

With this question the following was also submitted: "Will the Italian bees be diminished in their good qualities by crossing with the German or any other race of bees?"

Mr. Baldwin—I know nothing of any bees but Italians. They suit me. It takes careful work to keep my Italians' blood up. A lower kind of the same species will degenerate a higher. A race above the Italians would lift them up.

Mr. Haley—Where the Italian bees degenerate, do not the lower races gain some ?

Mr. Baldwin—The progeny from an Italian queen crossed with a black drone is better than that of a black queen crossed with an Italian drone.

The further discussion of the question was laid over to second day.

Mr. Rosser—How long will a comb be good for brood comb in hive ?

Mr. Nebel—I have some eighteen years old.

Mr. Larch—I have combs used for twenty years.

Mr. Atkins—Have combs used fifteen years.

What is the best method to stop robbing ?

Mr. Morton—I have had but one experience. I put the robber hive on the stand of the robbed, and *vice versa.*

Mr. Rosser—The best thing I ever tried was to put a sheet over the hive being robbed.

Adjourned to 9 o'clock a. m. Thursday.

MORNING SESSION.

The convention was called to order at 9 o'clock.

Moved that the convention take up questions in box for discussion. Carried.

"Do flowers furnish the same amount of nectar every year ?" The committee says, "No."

"What is the future outlook for the bee keepers of Missouri ?" Committee says, "not very flattering."

Mr. Rosser—I think prospects good from the start clover has now.

Mr. Atkins—In my country, clover prospect is fine.

Mr. Morton—I think the prospect for the future as good as the past.

Mr. Baldwin—It is well to look to the future with hope, but facts are stubborn things. The future prospects lie more in the bee-keeper's management than in anything else.

"Should we use queen-excluding honey-boards under all circumstances in the production of extracted honey ?"

Mr. Baldwin—Yes.

Mr. Nebel—It is not necessary under all circumstances.

Mr. Pew—I would not do without them.

Mr. Morton—Find them work to my satisfaction and approve of them.

Mr. Collier—Would use wood if I could not get zinc; it pays.

"How shall we elevate the moral standard and social taste of our Italian queens above associating with black drones ?"

"Is a sectional brood chamber a beneficial adjunct to a hive?" No.

Mr. Morton—It's patented.

"What treatment for fertile workers?" Committee says, "introduce a fertile queen."

A member—Will the fertile worker kill the queen?

Committee—Not if queen is introduced right.

The question of location of next meeting was taken up. Jefferson City, Boonville, St. Louis and Macon City were named. A ballot resulted: Boonville, 14; Jefferson City, 5; Macon City, 1; St. Louis, 2. The time for holding the convention was, on motion, set between April 1 and 10.

Moved that the President appoint a committee of three on resolutions to report at 5 o'clock. Carried.

The President appoints Nebel, Rouse and Morton.

AFTERNOON SESSION.

The convention was called to order at 1:30.

The question as to the relative merits of races of bees was taken up for further discussion.

Mr. Collier—Have had eleven years' experience with Italians; have had bees considerably mixed up; have watched them and their proceeds; the Italians are the best defenders of their homes; they are gentler to handle; on close examination can't see that the blacks dress honey nicer.

Mr. Pew—Have had experience with four races; the Holy Lands don't suit me and I got all I want of Carniolans in one season; I now try to keep my Italians as pure as possible.

Mr. Nebel—Have tried different races and want only Italians now.

Mr. Baldwin condensed the discussion—As I understand the discussion, the Italians are preferable in Missouri; the blacks have some points above, but the weight of argument is in favor of Italians.

"What importance is there attached to the brace-comb annoyance in the manipulation of hives?" It depends on the amount of them.

"What does the bee coming from the field laden with honey do with it on entering the hive?" Store it in combs, of course.

Mr. Robinson—I think Doolittle says they deliver it to the nurse bees and they store it in the combs.

"How dispose of a surplus of pollen in extracting combs?"

Mr. Pew—Should I find any, I would put it down in the brood chamber.

"Is it practical to requeen hives after swarming?"

Mr. Robinson—Sometimes it is necessary. If you remove all queen cells but one and it fails to hatch, it is necessary to requeen.

"Have you had any trouble in getting queens fertilized in old colonies this year?" No.

"Do young queens always go out to be fertilized?" Yes.

The committee on resolutions reported as follows:

Resolved, That we extend the thanks of the Association to the people of Mexico for their interest in our Association and for courtesies extended to us.

Resolved, That we extend thanks to the proprietors of the Ringo house for their offer of the free use of their parlors for the convention.

Resolved, That we extend thanks to the officers of the county, and especially to the sheriff for the use of his room in court-house for the Association.

Resolved, That we extend thanks to the newspapers for printing notice of meeting, and also publishing proceedings from time to time.

The resolutions were adopted and ordered spread on the minutes.

Moved that 200 copies of the minutes be printed. Carried.

Adjourned *sine die*. J. W. ROUSE, Sec'y.

The following statistics were handed to the Secretary:

Members.	No. colonies.		Comb honey...	Extracted honey...	Wax......	Vinegar..
	Spring.	Fall.				
T. A. Pew	60	57	361	1,025	....	....
L. C. Cheatham	40	70	945	....	8	....
John Nebel & Son	258	265	100	1,000	100	....
R. B. Leahy	23	33	25	300	25	....
Byron Iiams	62	70	....	3,300	30	1 brl.
E. C. L. Larch	168	168	500	11,500	....	....
G. B. Morton	16	23	350	550	10	20 gal.
R. Gaines Robertson	21	37	425	315	....	....
William Davis	72	97	100	500	20	....
J. S. Atkins	76	108	2,000	500	20	....
J. W. Rouse	54	54*	500	500	35	....
J. R. Rhodes	25	40	500	1,200	30	....
M. B. Robinson	62	92	400	4,000	75	....
P. P. Collier	65	85	300	800	47	....
W. E. Thompson	21	30	600	....	....	....
A. M. Creel	60	75	1,500	....	....	....
J. N. Rosser	18	28	500	....	3	10 gal.
L. W. Baldwin & Sons	550	900	20,000	....	....	....
P. Baldwin	111	165	6,500	....	....	....
E. R. Garrett	45	80	500	500	....	....
H. Martin	53	53	400	3,600	....	....

MEXICO, MO., February 9, 1891.

HON. LEVI CHUBBUCK,

Secretary Missouri State Board of Agriculture, Columbia, Mo.:

DEAR SIR — By your request I submit the following report gained from 142 bee-keepers of Missouri for the season of 1890:

No. of colonies, spring, 5,560; No. colonies, fall, 6,610; pounds of comb honey, 77,903; pounds of extracted honey, 88,202; pounds of bees-wax, 979. We also report twenty bee-keepers with 450 colonies of bees, but have not their report for honey.

The largest number of colonies reported by any one person was, spring, 550 colonies, fall, 900; the lowest number was, spring, 3, and fall, 4 colonies.

The average number of pounds of honey per colony reported is 29.95 pounds. The season generally was very poor for a honey crop. Apiarists that have Modern France hives have their bees generally in fair condition. Many of the bees in old box hives will die before spring opens up.

Respectfully,
J. W. ROUSE,
Sec'y Missouri State Bee Keepers' Ass'n.

BEE CULTURE.

[By J. W. ROUSE, of Mexico, Mo., Secretary Missouri State Bee-keepers' Association, and read at the Mexico (Mo.) Institute.]

Through your worthy secretary I am requested to give to the Missouri State Board of Agriculture a paper on bee culture.

I am located in the city of Mexico, only on account of close proximity to railroads for the advantage they give me in my business.

I wish to say I was reared in the rural districts and am in full sympathy with agricultural pursuits, and will endeavor by this paper, if possible, to encourage an industry that is a part of agriculture, and which, if pursued as a vocation, is of no small pretensions.

"Among the minor branches of rural industry, bee-keeping is one of the most important, though its prominence is not generally recognized, from the fact that it is almost everywhere carried on as an incident of general agriculture and but rarely as a leading rural occupation."

In many localities, as in portions of New York, Vermont and Michigan, Wisconsin, Iowa, Illinois, Indiana, Ohio, and many other states, and especially California, where existing conditions are favorable, apiculture is very prominent, often predominating over other industries in a neighborhood. There are many states where it is coming prominently before the public. Here in Missouri it has taken a prominence in the last year or two it never had before.

While a great many only keep bees as a side issue, even then, if done intelligently, it pays fully as well if pursued from year to year as any other agricultural pursuit.

It pays to some extent to keep bees in a gum or common box hive, but it pays much better as a rule to have the bees in a movable frame hive, where the bee-keeper can examine his bees and see their condition, and give them attention when needed, but best of all to get the surplus honey in nice shape to take from the hive free from pollen, or bee-bread as it is sometimes called, also free from young bees. Allow me to urge the importance of getting the surplus honey in nice shape, either for home consumption or for the general market. If this is done, it is much more palatable for home use, and for market purposes will bring from two to ten cents per pound more than chunk honey or honey that is in bad shape.

Comb honey should be put up by the bees in sections given to them by the bee-keeper.

Extracted honey is the clear liquid honey taken from the comb by having the bees put it in a frame that can be lifted out of the hive, the cappings then shaved off with a sharp knife, and then put in an extractor or tin can having a basket or reel to hold the frame while it revolves around inside the can, and the clear liquid honey being thrown out of the comb by centrifugal force, and the empty comb then put back in the hives for the bees to fill again with honey, and so on indefinitely.

Such honey is as nice as honey can be obtained, and is far superior to the honey commonly called strained honey, which is usully obtained by opening the top of a gum or box hive and taking out the honey in sight, containing more or less pollen or bee-bread, also larvæ, and most always some old black comb; or as is frequently the case, the bees are killed and all the honey taken, and that which is obtained in a messy shape, is usually squeezed out of the comb with the hands and strained through a cloth. Such honey almost always contains pollen, and frequently larvæ mashed up in the honey.

Such honey is scarcely ever fit to be eaten. It usually soon gets a strong rancid taste or sours.

THE MISSOURI STATE BEE-KEEPERS' ASSOCIATION

Was organized over a year ago at Higginsville, Mo., with twenty-two members, thirteen of whom reported having taken nearly 80,000 pounds of honey. The season was excellent.

At the last meeting in Mexico, with a list of seventy-four members, twenty-one of the members reported having taken over 66,000 pounds. The season was poor.

The estimate given by Mr. Thomas G. Newman, editor of the American Bee Journal, some years ago, is that there are 300,000 bee-keepers in the United States and Canada, and the annual average product of honey is 100,000,000 pounds; and these estimates are far short of the real facts now.

To give some farther idea of the extent of the industry, we give some figures taken from the American Bee Journal, in 1889, on foundation, which is bees-wax run into thin sheets, and then put through a mill that makes the impression of the bottom of the cells just as the bees make it. The foundation is then fixed in frames, or sections, and given to the bees, and they draw the walls of the cells out and add more wax of their own make, and thus make the comb in which to store honey in much less time than if they had to produce the whole stock at the time.

The journal referred to gave the product of one firm (Mr. Charles Dadant & Son) as 59,551 pounds of bees-wax into foundation.

Of this, 34,498 pounds was made into brood foundation, which would fill 210,520 Langstroth brood frames, or it would fill 21,052 ton frame hives, and if only one-inch strips of foundation were used as starters in the brood frames to give the bees a start to work from, it would be enough starters for 168,416 hives.

This number of sheets 8x16½ inches, if piled on top of another, would make a pile 2,924 feet high, or nearly three times the height of the Eiffel tower. If placed at the end of one another they would make a line nearly 55 miles in length.

The balance (25,053 pounds) was made into thin and extra thin foundation for surplus honey, and would fill 2,605,512 sections 4¼x4¼ inches, or, if used as starters, as most apiarists do use it, would give starters to four or five times as many sections, or about 12,000,000.

This 25,053 pounds, if cut into sheets the right size for 4¼ sections and the sheets piled upon one another, would make a pile 16,702 feet high, or over three miles, or if placed at the end of one another would make a line 154 miles in length.

These are startling figures but nevertheless are true, and will give some idea of the extent of the production of honey, as the thin foundation spoken of was for comb honey, and there is much more extracted honey produced than comb honey.

While this firm making foundation have the largest manufactory in the world, it is by no means the only one which makes foundation, as there are several other factories that make large quantities, and great numbers of factories that make small quantities.

We have two considerable foundation factories in this State and a number of smaller ones.

Of hive manufactories, there is one in the east reports having made over 35,000 hives in 1890, and there are several other factories that make nearly as many each, and large numbers of factories that make hives in smaller numbers. We have two considerable factories in this State, besides numbers of smaller ones that make hives.

Bees are very useful in fertilizing the flowers of fruit-trees and clovers by carrying the pollen of the flowers from one to that of another.

We might give many other items on this interesting subject, such as the queen depositing the eggs in the cells, and after three days they hatch into larvae; the bees then feed them until they are seven days old, when they are generally sealed or capped over in the cell, where they remain eleven days more, when they cut out of the cell full grown, making twenty-one days from the time the eggs are deposited until they come out ready for business; the larvæ intended for queens are fed differently from the other larvae, and come out of the cell full grown in sixteen days. The drones take twenty-five days to come out of the cell. Also, how to Italianize a colony or apairy, and how to work for comb or extracted honey, and many other things, but would refer you to some good text-book on this subject, where you can post up on the business and go at it scientifically. "Oh!" but says one, "we have not the time to do this with all of our other business." Well of course you could not become a full-fledged apiarist in a short time, but you would be surprised how soon you would learn the principles if you would go at it; and then if you are going to keep bees at all, do so in a way that it will pay you.

We would like to urge our Agricultural College at Columbia to take up bee culture and teach it to the students.

Rhode Island has a professor that is a practical apiarist, who is teaching the business to his pupils; and the bee-keepers of the United States have a grand man in their ranks in the person of A. J. Cook, of the Agricultural College of Michigan, who is teaching the business to his students. He is of great benefit to the bee keeping fraternity, as well as to others, as he is able to answer almost any question sent to him on bees or other insects.

In conclusion, we would say we do not wish to encourage any one to go into bee-keeping as a business, with the expectation of making large returns immediately, as it is usually only the man who sticks to the business and pursues it that makes it pay well. Persons having bees as a side issue, if they miss a crop of honey for one or two seasons, experience no great difference in their general business. It is the man who is in the business for a livelihood that would be affected most with a failure. But when a good season does come, if he is prepared for it he will reap a rich and sweet reward.

The bee business, like all others, has its draw-backs at times, such as a dry season, or it may be, too wet and cool; but we believe if the business is followed intelligently from year to year, it will give as good returns, and even better, than many other occupations.

BEE-KEEPING.

[An address by M. E. ARMSTRONG before the Farmers' Institute, New Haven, Mo., Januay 1891.]

Bee-keeping, like many other branches of agriculture, embraces a wide range of territory, and is engaged in by many kinds of people in many kinds of ways, and of course with various degrees of success. We find the specialist with his hundreds of hives, devoting his time and care to his bees, not only getting honey out of the business, but his bread and butter as well; and then we find bee-keepers all along the line from that down to the farmer who has perhaps one or two colonies, and these in log gums in a corner of the yard; this latter is one who does not have "luck with bees any more."

Notwithstanding we find that bees were kept away back in the early centuries—just how early, perhaps it is not possible to tell; see Genesis 43 and 11—we may almost with certainty say that bee-keeping is only in its infancy; we are led to this conclusion when we look over the list of intelligent, progressive men who are giving a great deal of their time and best thoughts to the advancement of the profession, which we may venture to call it. There has been progress all along the line.

Improvement in breeding up to a high standard the different races of bees, improvement in the hives and their inside arrangement, improvement in surplus arrangement, or rather that part of the hive where the bees are to store their surplus honey; improvement in all the implements used in the bee yard and the machinery for making them, and also improvement in the method of handling and marketing honey; yet it is generally conceded that in all these there is yet room for improvement. Among some of the inventions of even the last quarter of a century, I might mention the honey extractor, comb foundation, honey knife, solar wax-extractor, bee-smoker, section honey boxes, queen and drone traps, queen cages for sending by mail and introducing, bee-escapes, and perhaps some other articles of great use that I do not just now call to mind.

Yet, with the fact before us that bees and the use of honey, the latter even as an article of commerce (see Ezekiel xxvii: 17), date so far back, and with the number and intelligence of many engaged in the business, we find a great deal of ignorance—perhaps it would sound better to say want of information on the subject. It seems strange to meet with persons, even of middle age, who have never eaten honey, and of course have no knowledge of bees, their habits, or of the methods of handling them. I last year sold a man a few pounds of honey which he said was the first he had ever tasted; another gentleman wanted some honey, but would take only five pounds, as he did not know whether or not his family would eat it. I will take the occasion to say it was only a few days till he wanted more honey. Only a few days back a man, at least fifty years of age, told me he did not remember tasting honey more than once in his life.

By way of suggestion, I think that at farmers' institutes, in all agricultural and horticultural meetings—for the bee is the friend of the horticulturist—in agricultural papers and even in general newspapers, more time and space should be given than has been given heretofore, in order to bring the business into that prominence it deserves. To be sure, we have a number of bee papers and magazines of high order published in the United States, but these rather follow a knowledge and interest that has already been awakened, than create or arouse that interest, because they reach principally those who seek after them.

But what is the need of creating an interest in pursuit of bee-keeping? It is to induce those who are so situated as to be able to do so, to produce honey enough to supply their own tables, and create taste and demand for it that it will make it profitable for those who produce a surplus.

Honey, like fruit, is certainly healthful, and when we create a taste for it we are helping to place on the tables of our land the purest of all sweets, and helping to make an honorable business profitable. Mr. Thomas J. Newmann, of Chicago, editor of the American Bee Journal, says "honey was among the first sweet things, and the sweetest of first things."

Again, by way of suggestion, let each and every farmer get a colony or two of bees and give a little time and attention to them, and try to place on their tables that which will no doubt prove a pleasure as well as a blessing to themselves and their families.

But, as the old style of hap-hazard, slip-shod farming in all its branches is out of date and should be cast aside, so the time for log gums, nail-kegs and flour-barrels is past, and all who intend to engage in bee-keeping should get a good book or two on the subject, of which there are quite a number of good ones which are cheap, and a good bee paper or magazine. Adopt some of the tried and well-proven style of hives; get them up in a neat, creditable manner—if we paint them, so much the better—then devote a small portion of time to the study of and attention to the business, and you will perhaps be surprised at the pleasure and profit you will derive from it.

POULTRY-RAISING.

(Paper by G. W. FRY, Dunlap, Mo., and read at the Trenton, Farmers' Institute.)

The vastness, importance, growth, possibilities and profit of poultry culture do not obtain to a proper degree in farming communities. It has been stated by good authority that poultry and its products exceed in annual market value that of any stock industry. Atchison county produces over $50,000, Nodaway county over $80,000, Grundy county over $60,000 of poultry and products annually. (Five car loads have been shipped from Galt this season.) A car contains about 400 dozen, making in all 24,000 fowls, at a value of nearly $5,000. Taking Grundy county as an average county for the State, and the same is possible to all the counties; the poultry products of Missouri ought to amount to $6,840,000.

Possibilities in poultry culture are in no great degree attained. All who raise fowls for eggs are making a good profit on stock and feed. A good hen will lay twelve dozen eggs per annum, worth at 12½ cents per dozen, $1.50; deduct 50 cents for feed, and we have $1 profit per head.

This, it will be seen, is about five times the value of a common hen in the market.

The great drawback to the many in poultry culture is disease. Many are deterred from buying good stock on account of possible disease. The main trouble in this line is want of care. Other stock on the premises get reasonable care, but the poultry have to care for themselves, because of the general opinion that they amount to but very little. One neighbor lately said, "I don't see what is the matter with my chickens. I clean the hen-house every year, and nearly every season have cholera among them." What farmer would expect success with animals and give them such care? The poultry-house should be cleaned once a week and often disinfected with lime or carbolic acid.

Parasites are the greatest natural enemy to fowls. More than two-thirds of so-called cholera is from ravages of lice. The symptoms are similar to cholera, but remove the lice and the birds recover without treatment. True cholera can be cured by a tonic made of copperas, one-half pound; sulphuric acid, one ounce; tincture iron, one drachm; hot water, one-half gallon; one tablespoonful to each pint of drinking water.

Roup is more prevalent than is generally supposed. It is brought on by damp quarters, drafts through roosting places, or exposure to storms. Symptoms: swelled head, blear eyes, discharge from nostrils, rattles in throat; when none of these appear, it is shown by offensive breath. The disease is similar to catarrh, and results in diphtheria or canker. Prevention: keep the birds dry and warm. Cure: separate the sick birds; bathe the head in warm water; take a gill of kerosene, add five drops carbolic acid, put in a small can; put two drops in each nostril, and as much down the throat. Two treatments per day for a few days usually effect a cure. Bromide of potash, size of two peas, dissolved in one-half gallon water, is a good preventive and cure for roup.

The great want of the times is more literature. We are sorry and ashamed of the fact that the farming public does not read enough. We know of well-to-do farmers who take one paper only. When solicited to take a swine or poultry journal or an agricultural journal at trial or half price, they say: "Don't guess I'll take it now." These parties, to my personal knowledge, lose enough swine and poultry, annually, to pay for a dozen journals. Every man ought to take the literature of his craft. What would be thought of a doctor, lawyer, preacher, merchant or mechanic who did not take the journals peculiar to his business? Every farmer who expects to succeed should take, besides his local paper, at least one religious, one political paper, one agricultural paper, one poultry journal and a swine journal; the whole outfit can be had for $6. Certainly any family in this fair land can be benefited to this amount in reading six papers for a whole year.

Hundreds of times each year the question is asked: "Which are the best breeds?"

For eggs alone, the Leghorn is unsurpassed. For eggs and table qualities, the American class is ahead, and is likely to stay there. This includes Wyandottes, P. Rocks, Black Javas and American Dominiques. The annual production of poultry in the United States is between 600,000,000 and 700,000,000 dollars. We buy of other nations 12,000,000 dollars worth of eggs. There is no good reason why these imports may not stop, and supply the demand at home; hereafter there will be a tariff of five cents per dozen on imported eggs. If eggs can be imported and still be fit to use, they certainly can be shipped from the West to New York and Boston with a profit to the shipper and producer.

No farm, county or State is producing to a full extent in poultry, and there is no good reason why we may not make the supply equal to the demand and keep our money at home.

COUNTRY ROADS.

A SERIES OF ARTICLES UPON THE IMPORTANCE OF AND HOW TO SECURE GOOD ROADS.

[Read at the Ninth Annual Series of Farmers' Institutes, held by the State Board of Agriculture.

THE COUNTRY ROAD PROBLEM AND A PLEA FOR MORE GRAVEL ROADS.

The following paper by Hiram Phillips, of the civil engineering faculty of the Missouri State University, was prepared for and presented at the Farmers' institute held in Mexico, Mo., December 20, 1890:

We need no more experiments in road-making. Nearly every road overseer follows his own peculiar fancy in road-making, and continuing in office for only a short time, his successor pursuing an entirely different method, the results obtained are very poor returns for the expenditure.

The principles involved in road-making are exceeding simple, and enough has been written upon the subject, and statistics gathered, to make a large library. The most of these works are within the reach of all who may desire to consult them, and it would seem that all has been done in that direction which could be done to further the improvement of our roads.

Road-making cannot be wholly learned from books; like all other mechanical arts, the only way is by practical experience. It is theory and practice which makes perfect.

The cardinal principles of road location, construction and maintenance briefly stated are: They should be as straight and as level as circumstances will permit. The road-bed should be perfectly drained, and the surface constructed out of material which will bind together, is tough and hard, and which will not polish under traffic. The roads should be given such a slope as to speedily carry off all water that falls upon them, and the repairs should be made just when needed.

All over the United States, especially in the West, the question of obtaining good roads is a complex problem. With our almost unlimited territory, which is comparatively sparsely inhabited, laid off in large tracts devoted mainly to grazing, and where the amount of money available for road construction and maintenance is very small per mile, it is utterly impossible, even with the most improved methods and machinery, to secure more than "passable roads."

A dirt road is a very poor excuse at best, and so long as we depend upon them we are at the mercy of the elements and the man with the narrow tires and heavy load.

Now it is possible with a certain amount judiciously expended to keep a dirt road in a "passable" condition, when it does not rain for a few months in the year, but it is impossible to do more.

It has been demonstrated that after travel and traffic has reached a certain magnitude, it is not only desirable but a financially paying investment to construct gravel or macadamized roads.

WE NEED A NEW ROAD LAW—

One which will collect more revenue, paid in cash, that will expend it, at the right time and at the right place, under contract, and one which will regulate the width of tires. It has been conclusively proven by extended trials, both in this country and in Europe, that the power necessary to draw a given load on macadamized roads varies inversely as the width of the tire, and on common dirt roads practically the same for all widths. It is an outrage on the traveling public to permit a thousand-pound wagon, with a three-inch tire, loaded with a hundred bushels of coal, to plow up our roads, when a six or eight-inch tire would not increase the draft, but would improve the road.

This same wagon, in passing over a dirt road during the time the frost is leaving it in the spring, or just after a soaking rain, will do more damage than can be readily calculated.

In Germany the rate of toll is in proportion to the width of the tire and load, and the toll on a load such as mentioned above, on a three-inch tire, would be appalling.

The effect of narrow tires is so well understood in New York State that the turnpike road law provides that a tire six inches wide should only pay one-half the usual toll, those with wheels nine inches wide only one-fourth, and those with tires twelve inches wide shall pay none. These proportions agree precisely with those deduced from observation by an experienced English road-master.

With a road law on our statute books providing for:

1st— Increasing the revenue,

2nd—Making it payable in cash,

3rd—Putting its expenditures under the superintendence of a practical roadmaker,

4th—Having the roads repaired by contract,

5th—Having them constantly repaired when needed,

6th—Regulating the width of tires,

We would then be in position to put our dirt roads, by the use of the most improved machinery and practical methods, in as good condition as the soil which composes them permits.

HOW TO MAKE GOOD ROADS.

To a close observer it is very apparent that the imperfect condition of our country roads is caused more by ignorance of drainage, both surface and underground, then from all other defects combined. Too much surface slope causes ruts, and not enough, deep mud-holes. With poor culverts and imperfect under-drainage a good road is impossible. A road may be very poorly located, but by good drainage be kept in excellent order, and it is equally true that no matter what the natural advantages of location, it can be irreparably ruined in a short time by poor drainage.

If a soil is infested with springs which destroy the stability of the road-beds and keep them boggy and muddy, they should be tapped near the fountain head by blind drains, so as to conduct the water to side drains. After the drain is constructed the earth is filled in over it, and the slope restored to its required shape.

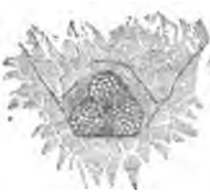


Fig. 7.

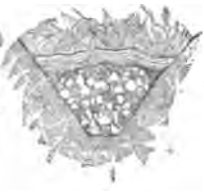


Fig. 8.

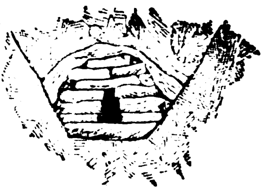


Fig. 9.

Figures 7, 8 and 9 show cross-sections of three forms of drains, any one of which will answer for this purpose in ordinary cases.

Figure 7 is constructed with three fascines laid longitudinally in the trench excavated to the source of the spring.

A single fascine of equivalent area in cross-sections or loose brushwood may be substituted.

Figure 8 shows a blind drain of fragments of stones or loose rubble. In figure 9 a clear water-way is left in the middle of the drain. In any case, the sides and top of the drain should be covered with straw, coarse grass, small brush-wood or sod, with grass side next the drain, to prevent it becoming choked with earth.

The cross-drains and culverts come next in importance, and they may be made of brick, plank, tile-work or cement. They should be so proportioned as to be capable of carrying off the greatest amount of water that would fall during the heaviest known rain fall. A tile or concrete culvert is considered the best, if properly constructed, and practically indestructible.

Figure 27 shows the form of cross-section for culverts which admit a minimum thickness in the concrete and the use of forms to shape the sides and bottom. For a culvert twenty-four inches inside width at base, the sides and bottom need not be more than five or six inches.

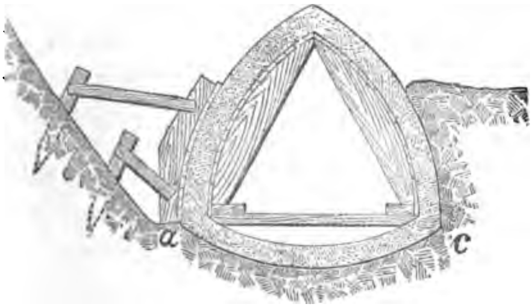


Fig. 27.

Good concrete may be made by using one part of Louisville cement, five parts of clean sharp sand, and ten parts of broken stone. If Portland cement is used. one part of cement to ten of sand and fifteen to seventeen parts of broken stone. With all the under-drainage properly constructed so as to relieve the road-bed of all water beneath the surface, the next in importance is to give its surface the proper slope. This is too often determined by the eye, and, as the eye is a very imperfect and unreliable leveling instrument, the work is poorly done.

Figure 33 shows a very simple instrument which can be made by any carpenter, and by its use the cross section of the road can be accurately shaped.

ADVANTAGES OF GRAVEL ROADS.

A dirt road, even under the most favorable conditions, fails in many essential qualities to be a perfect road. What is needed to insure the rapidity, safety and economy of travel and traffic, is a road which will be passable, regardless of the seasons, mud, snow or rains, and to secure this our roads must be constructed out of some kind of material unaffected by the elements.

It has been asserted on good authority, that all macadamized or gravel roads which have been built in our western country have been a commercial blessing to the localities they traverse, and have added far more value than their cost to adjacent lands.

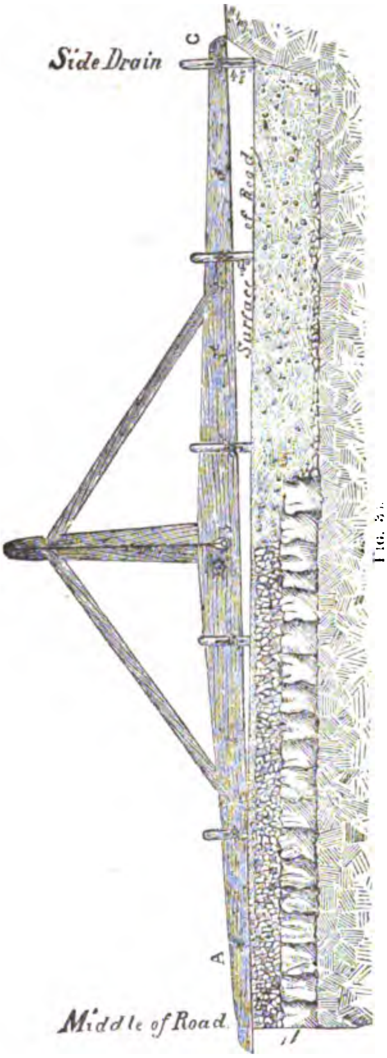


FIG. 3.

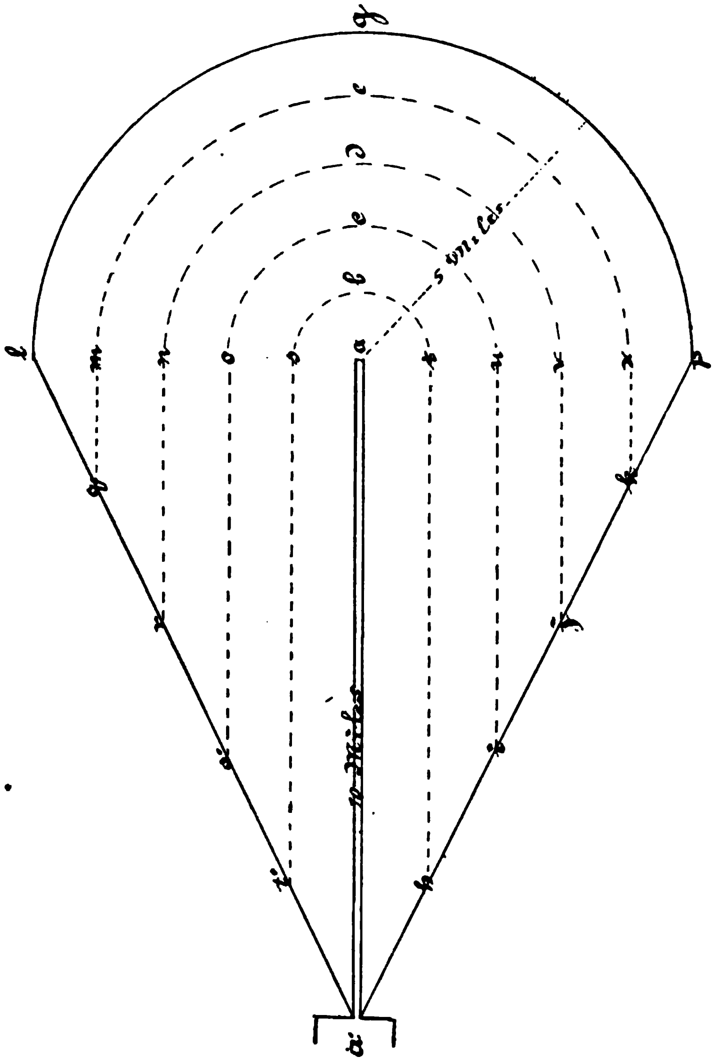
It has long been conceded by our National and State governments that internal improvements are objects of pecuniary aid and encouragement. In pursuing this policy princely sums are yearly expended on our navigable rivers and harbors, and land grants innumerable have been donated to our railroads.

Our navigable rivers are public highways, our railroads common carriers, and so also are our roads public property, and their construction and maintenance should receive the same fostering aid that has been so lavishly bestowed on rivers and railroads.

A good road connecting any locality with a commercial center benefits not only those who own land contiguous thereto but the community at large. The most advanced thinkers on the road question now demand that roads built between county seats or commercial centers should be built by the county and State; those between towns of local importance by the county, and only those of purely local use by the community interested. The growth of this conception of the problem is manifested in the amount of attempted legislation in this direction in almost every state in the Union. Should this conception be too far in advance of public opinion it will be well to consider the plan of the locality most interested in building them.

In figure 34, suppose *a′ a* to represent a gravel or macadamized road ten miles long built from a town *a*, and the distance *a l*, *a g* and *a p* to be five miles.

A ten-mile gravel road with a nine-foot gravel and a nine-foot dirt surface at an average estimate can be built at a cost of $5,000 per mile or $50,000 total cost. Supposing everyone living within a radius of five miles from the end of this road would use it and others nearer the city would come a proportional distance to it, we have the number of acres tributary to this ten miles of road, about 57.000. If this land benefited by the road was taxed directly to provide funds, it would be



[Fig. 34.]

less than $1 per acre, or counting the benefit derived to be inversely as the square of the distance from the road—that is, the amount of tax per acre on *a h t b s t'* is the amount of tax on *h i u c o s' t' s b t* is to tax on *s' o c u i j v d n r* is to tax on *q m e x k p g l* as 1 to 1-4 as to 1-9 as to 1-16 as to 1-25—would make the greatest rate per acre $3 and the least 12 cents.

In case one-half the amount could be secured from the county or State, these figures would be reduced to $1.50 and 6 cents.

Would it pay a community to make such an investment?

IMPORTANCE TO RAILROADS OF GOOD WAGON ROADS.

[Read by M. KNIGHT, General Traffic Manager of the Wabash railroad, at the Farmers' Institute held by the Board of Agriculture, December 20, 1890, in Mexico, Mo.]

In the preparation of this paper, the chief difficulty presenting itself is that always attendant upon the discussion of a proposition so plain and simple that it may be said to prove itself.

A good old bishop of Denmark once wrote a book upon the natural history of Iceland. The book, as a whole, is very dull, and has fallen into oblivion, but one chapter has achieved lasting fame; it is the chapter on snakes, which reads (I quote it in its entirety): "There are no snakes in Iceland." I might well profit by this example, and sum up my subject in the single sentence: Without wagon roads there would be no railroads; for everything I can say beyond this is but by way of illustration and emphasis.

When railroads were first projected, there were not wanting those who believed that they would almost entirely supersede wagon roads, and that as a consequence, horses, which were then a possession of great value to their owners, would be rendered well-nigh worthless. The conjecture was really a plausible one, for if the work being done by horses was to be done thereafter by steam engines, what use would remain for the horses? It left out of view what is now clearly enough seen, that the railroads, like all other great inventions, would create a new and peculiar sphere of service, leaving ample scope in other directions for all other existing forces of industry.

Sixty years mark roundly the life of our railroad system. We have now built and in use 161,397 miles of railroad—sufficient to span the distance from New York to San Francisco fifty times—equipped with 31,062 engines, whose capacity is stated at 31,062,000 horse power, and 1,060,164 freight cars of more than 15,000,000 tons burden, doing a business that in the year 1889 was equivalent to 68,604,012,396 tons of freight carried one mile, or more than one thousand tons carried one mile for every man, woman and child in the country. This service was performed at an average cost of 0.976 of a cent, or less than one cent per ton per mile, being for the whole about ten dollars per capita of our population. Done by the methods in use before railroads were known, this service would have cost twenty times as much, or two hundred dollars per capita, a sum as great as the entire wealth production of the country. At such a cost, the commerce now existing would be impossible, as it would engross all the energies of our people in the transportation of commodities, leaving nothing to be applied to the business of production. This shows that the function of the railroad was essentially a new one, the transaction of a business that was not possible to be done by other methods.

Mr. Poor, in his railroad manual for 1881, says: "Over ordinary earth roads, wheat will bear transportation for a distance of only 250 miles, when its value is $1.50 per bushel at the market. Indian corn will bear transportation only 125 miles, when its value is 75 cents per bushel. When grown at greater distances from market, these products, without railroads, have no commercial or exportable value."

These estimates present themselves as reasonable, and, taken in connection with the distances over which commodities are now carried to market, they show that the business of the railroads was to do something not done by wagon roads; and further consideration will prove that so far from supplanting or superseding wagon roads, they have but increased them in extent and necessary use.

I have not been able, within the time at my command, to find statistics of the mileage of wagon roads, but it is apparent upon the most superficial view that it exceeds by many times the mileage of the railroads, and the extension of the system keeps pace with, if it does not forerun and outrun, the extension of the railroad system.

As to the horses which it was feared would be rendered useless by the introduction of steam engines, the census reports present us with instructive figures: In 1840 the horses and mules in the country numbered 4,335,669; in 1889 their number was 15,920,868. A comparison with the population at the periods named shows that the increase of these animals has been relative as well as absolute. But the mere increase in number does not tell the whole story. The increase in their value has been very marked, and never was the interest in their breeding so great as it is now. In this day of the Mogul engine, with its ability to draw on a level a load of seventeen hundred tons burden, our farmers, not confining themselves to the best blood of their own country, are ransacking the best stables of England and Belgium and

France for draft horses, and thousands of dollars are not uncommonly paid for a single sire. In this day of the passenger locomotive, with its sustained speed of sixty miles an hour, the unexampled sum of $105,000 is paid for a single trotting stallion.

The value of the horses and mules in the country is not less than $1,200,000,000. This is equal to if not in excess of the value of the motive power and rolling stock on our railroads, and yet the comparison is not altogether a just one, as it leaves out of the account the vehicles in use upon the wagon roads. As the wagon roads of the country are a public possession, we are not in the habit of considering them as property, and yet they are such in every just sense of the term. That they are held jointly instead of in severalty does not affect their intrinsic value. Estimating them upon a fair basis, I am of opinion that they at least equal in value the railroads of the country, nor would I be surprised if careful inquiry should prove them to be far in excess.

In this concurrent development of wagon roads and railroads there is no paradox, and there is the strongest possible proof of the harmony of relation between them. The commerce of the country neither begins nor ends at railway stations. It begins in field and forest, in mine and factory, wherever men are engaged in the production of things needful for human use, and it does not end until these have been transported to the places—it may be to other fields and forests and mines and factories, or to the homes of our people—where they are destined for consumption.

We look upon the Mississippi with wonder and admiration, and hail it as the Indians did, as the Father of Waters; but after all, its mighty flood is but the sum of the little streams and springs by which its hills and valleys are watered. So the commerce of the country, drawn by tireless sinews of steel in long laden trains over the great railroads of the continent, is but the sum of what was first drawn by horse and wagon over the streets and highways of the land.

In this day of enterprise and invention, when not only the elusive vapors of the tea-kettle are made to perform tasks beyond the power of flesh and blood, but even the subtle, impalpable and mysterious force of electricity is made to render to humanity the triple service of light and speed and power, he would be daring indeed in his conservatism that would attempt to assign limits to our progress. Still we may say, that until inventions and discoveries are made which as yet it hath not entered into the heart of man to conceive, the function of the railroad in our transportation system must remain a limited one, and the wagon roads of the country must continue to be what they are, the sources and spring-heads of our commerce.

With this intimate relation existing between railroads and wagon roads, some suggestions as to the benefits to result from the improvement of wagon roads may be derived from railroad experiences. The charge for railroad transportation only twenty-five years ago was on the average more than three cents per ton per mile. It is now less than one cent per ton per mile. With these reductions in rate, products became marketable that were not so before, and the volume of transportation business was enormously increased, to the great benefit of every interest in the country. Some very instructive details might be adduced on this head, but the consideration most pertinent to the present purpose is as to the causes bringing about the reduction in rates.

The paramount causes were improvements. Railroads did not come into existence in perfected form. In their beginnings they were crude and their capabilities limited accordingly, but from the beginning there has been a steady and sustained improvement in track, in motive power and in rolling stock. Twenty years ago, with iron rails in use, the cost of laying a mile of track was $10,000, and the average annual cost of repairs was $1,400. The present cost of laying a mile of steel track is about $5,000, with an annual charge for repairs of about $700. Nor do these figures indicate the limit of benefit thus derived. The saving in wear and tear of motive power and rolling stock is a very considerable item. Twenty years ago freight cars weighed about 20,000 pounds and had a carrying capacity of about the same weight. Now freight cars are constructed weighing 30,000 pounds, with a carrying capacity of 60,000 pounds. The ratio of pay and dead freight then was an even one, now it is as two to one.

Other improvements might be pointed out by which the cost of transportation has been reduced, but I have said enough for my purpose. One thing, however, I must add: so far as improvements have cheapened transportation the resulting benefit has been a general one, promoting every interest and doing injustice to none. It is from a realization of what has been done for rail transportation by improvements of its methods, that I am brought to appreciate how important to railroads are improvements in the wagon roads upon which the railroads are so closely dependent. Precisely the same results must flow from improvements which cheapen, as all real improvements do, the methods of our transportation, no matter at what stage they apply.

Undoubtedly the rapid extension of the railroad system has induced a neglect of other means of transportation, but as railroads and wagon roads are supplementary to each other, this neglect has been just as hurtful to the general welfare as if it were manifested toward the railroads themselves.

Professor Ely, in his "Problems of To-day," a book written with especial reference to the needs of Maryland, and yet applicable in the main to every State in the Union, says:

> A distinguished American, who has recently passed some time in Baltimore, said that our public roads in the United States were the poorest which existed in any civilized country, so far as he had observed; and he has traveled extensively. The loss which this entails upon the agricultural community and the community at large is enormous. It requires more horse-power to pull a given load a given distance, and the waste resulting from the wear and tear of wagons and vehicles every year must amount to many millions of dollars. It was estimated some years ago that improved pavements in Berlin would save owners of horses on an average for each horse considerably over $25. There are over ten millions of horses in the United States; and if, to be quite within bounds, we place the annual saving which would result from first-class roads throughout the country at $10 per horse, it would amount to over one hundred millions of dollars, which is interest on two billions. This is probably moderate, for in cities like Baltimore, first-class streets in which only proper street-car rails were allowed, would save easily $25 per horse; and the farmers will bear me out, I am confident, when I say that in this part of the United States at least $15 per horse is a very low estimate for the annual saving which would result from excellent roads. The saving to vehicles and to harness must be added to the saving of horse-flesh; and when it is remembered that with good roads one horse would often suffice where two 'are now necessary, and always two where three are now required, it will be admitted that $20 a horse is not an extravagant estimate for the country. However, contenting ourselves with the low estimate of one hundred millions per annum, which is equal to interest on two billions of dollars, it will be seen how serious our loss in neglecting adequate provisions for highways.

Applying the estimate of Prof. Ely to the number of horses now in the country, and the annual saving to be effected by improved wagon roads will exceed one hundred and fifty millions of dollars.

But this is not all. With an improvement of the wagon roads, the distance over which commodities may profitably be hauled to the station will be increased, and products now treated as waste will become marketable, resources now unused will be developed.

Every one of you can no doubt suggest many respects in which you could increase and diversify the culture of your land if the facilities for reaching your market were improved. More of what is already produced would be hauled to the railroad station in exchange for what the railroad brings in, if it were not for the difficulties of the road to the station. In travel and transportation, it is not only the number but the kind of miles we have to go that is to be taken into account. The idea was well expressed by the little colored boy, who, being asked the distance to a certain town, answered, "if you walks it's ten miles, if you's got a hoss it's five, and if you's goes in a kerridge you's dar already."

In the older days of this country travelers looked upon the extent and character of wagon roads as marking the stage of development reached by the country through which they were passing; with wagon roads more in use than ever, the sign holds good to-day.

We are disposed to overlook advantages which are general. If wagon roads were private property, and the increase of travel over them redounded to private benefit, efforts would not be wanting for their improvement. In such a case resulting benefits would be only partially shared by the public. With our wagon roads a public possession, every dollar saved or made by their improvement is a general gain. To no end then so well as to this can public expenditures be so fairly and so profitably directed.

It is not good for man to be alone, the good book tells us, and in its every sense the saying is true. Men are improved by continual meeting and mingling with each other. By frequency of social intercourse the experience of all becomes the experience of each, and the individual is not left altogether to his own resources in working out the problem of life. Without association there can be no exchange. Commerce in things is impossible where there is no commerce of thoughts. So it is well for us if our ways, whether they be highways or byways, be well frequented, and whether the mission of the traveler be that of friendship or of business. To facilitate this intercourse of men with each other, by which their highest capacities for progress on material, mental and moral lines are stimulated, it is necessary to improve the ways and all the ways by which they are at once separated and held together.

The railroads feel that they will share equally with the other interests of the State in any improvement of our wagon roads, and it is a line of effort for the promotion of the general welfare in which they can participate, for it means benefit to all and injury to none.

The infirmities of human nature are such that with the very best intentions there will be a clashing of opinion and a crossing of purposes between different interests, and for this very reason there rests upon all good citizens the greater and graver obligation to unite their endeavors in any aim by whose attainment every interest will be served. We may differ honestly as to methods of distributing wealth, but we cannot differ as to the desirability of increasing the sum of wealth to be distributed, and we do increase the sum of wealth by every invention and improvement that gives increased efficiency to human labor.

Dean Swift has wisely said that he was a benefactor of his kind who made two blades of grass grow where but one grew before. In a way, every man does this who increases the efficiency of human labor in any sphere whatever. The object of all labor is to minister to our wants and necessities. These are so many and so diversified, and admit of such indefinite expansion, that there is no danger of our ever accomplishing too much. Over-production is an impossibility. It means that there is too much food, and this cannot be when any are hungered; it means that there is too much fuel, and this cannot be while any are cold; it means that there are too many houses, and this cannot be when any are homeless. Production is wealth, and it is the mission of wealth to minister to want. The day will never dawn when want shall have disappeared among men, for with new capacities new wants will arise.

The one sure way to serve humanity, the one way in which all can walk together, is improvement in the methods of our industries; and while production must always stand first in order of importance, close up to it stands exchange, which in its perfection enables man, wherever his lot may be cast, to share in all the blessings God has vouchsafed for his creatures, in whatsoever clime they may be displayed. And to facilitate this exchange, to make it possible among men, however near to or far from each other they may be, improvement at any and every step and stage of the process is helpful, and like unto making two blades of grass grow where but one grew before.

As a movement of the highest importance in the direction of facilitating exchange, the railroads are deeply interested in every effort for the improvement of the wagon roads, for they see in them at once the beginning and the end of that chain of interests of which they are but a link. They load from wagons and into wagons, and if the cost of hauling to and from their trains can be lessened, they will share in the resulting benefit.

The selfish interests of men are directed to the margin of profits in business, and there is the field of doubt, debate and difference. The margin of profits, however, will not in any line remain long above the general level or average. But whether or not this can be trusted to adjust itself, it is beyond question that a reduction of expense, whether in production or exchange, commending itself as it does by the twofold benefit of enhancing a commodity in real value to the producer and cheapening it in real cost to the consumer, will not accomplish itself, but will come responsive only to our best efforts.

Milton tells us of a way that he saw in his splendid vision of Paradise Lost, "A broad and ample road, whose dust is gold."

Let the highways of this State be so improved that the traveler upon them can pursue his journey without regard to weather or to season, and in a material sense we may apply to them the description of Milton, "broad and ample roads, whose dust is gold."

The Wabash company desire to be counted in line for the improvement of wagon roads, and will regard all necessary taxation for that purpose as for the equal benefit of every interest in the commonwealth.

ROADS A FACTOR IN CIVILIZATION.

[A paper by Prof. H. C. PENN, of the Mo. University, read at the Farmers' Institute held at Mexico, Mo., Dec. 20, 1890]

Just this season is not a favorable time for the discussion of highway improvement. All winter the roads have been in unusually good condition. It is only when the rains of the fall, the thawing snow of the winter and the showers of the early spring have deepened the mud till it thickens on the spokes to the hub, that one feels deeply the need of better roads.

"Roads as a factor in civilization." It is a common saying that the roads of a country are an index of its civilization. "The roads of a country are accurate and certain tests of the degree of its civilization." Is the statement true? Our nation is claimed to be among the most highly civilized, yet our roads are among the worst. In what sense, then, are the words true? Let us see. The savage desires little beyond the things within immediate reach. He lives on what he can put his hands upon and is content. As he rises in the scale of civilization his wants widen; he travels about; he exchanges his own products for others that he cannot himself produce. This is the beginning of commerce. Civilization advances, commerce widens, the wants of men become more various. People send here, there, everywhere, to get the things that satisfy them; until at the present day no man among us is in comfort unless he has at his command the productions of the world. To bring them to him, commerce must cover the earth with its lines of traffic. Roads must be hewn through the wild lands. Without them mankind would remain shut up to a narrow circle of products and a narrower circle of ideas. Civilization means advance in material, and still more in intellectual conditions. But ideas breed only when associated and married with other ideas. People must travel, must meet, must mingle with others; else there can be no improvement of ideas, no march of mind.

We see, then, in what sense roads are an index of civilization. The saying used to mean wagon roads; now it means railways as well, which for long-distance travel have superseded the more primitive thoroughfares.

A slight glance at the past would easily show the intimate connection of roads with the progress of civilization. Till the birth of the Roman empire nations had been comparatively shut up to themselves, except so far as the sea brought them into connection, or when some vast army broke with its resistless weight through the barriers that shielded one from another. Thus nations could live and grow only on the sea-coast, leaving the rich inland territories undeveloped. Commerce was a petty thing; little boats with their crude cargoes went at the mercy of the winds from place to place, laden not with the immense products of great inland nations. Each nation worked out its own salvation, limited in its ideas and in its material products to its own resources. By and by Rome arose. Roman statesmen saw that to bind the empire into one nation under one government required swift lines of communication between far and near points. And so Roman engineers began to build the roads that to-day are used for the nineteenth century's traffic. From the Eternal city on its hills radiated great thoroughfares to the most distant parts of the empire. They were the veins and arteries that carried life throughout the body politic; they were nerves that spread intelligence over a continent. The modern nations of Europe are built on the ruins of the Roman empire. Roman laws, Roman literature, Roman ideas, in a word Roman civilization, is at the base of western European civilization. But one of the great factors in the building up of that empire was its magnificent system of roads. Without them Rome could not have become the mistress of the world and the mother of modern progress. When the uttermost bounds of the empire were brought by her roads within a few days' travel of the central city, and the whole continent of Europe was thereby united firmly under her sway, Rome became immensely rich by the traffic of the countries that her roads developed, and strong enough to establish her own civilization throughout her territory. It was Rome the road-builder that sat upon her seven hills by the yellow Tiber and made laws for the nations of that day and of this.

The advantage of highways in the development of a country is seen in another picture that history unveils for us. Fifteen hundred years ago the first Englishmen came to England. They were a German tribe from the lowlands of Denmark. They were Dutch, in fact, and we are the descendants of those to whom, sometimes with contempt in our tone, we give that name. England was not England then; it was a half-civilized country inhabited by Celtic people, part of whom Rome had tried to civilize. The first of our forefathers to invade the island are known commonly by the name of Jutes. They landed on the southeast coast and overran what is now the county of Kent, but there they stopped. On the north the Thames and impassable swamps checked them; on the west the Andredsweald, a mighty forest, reaching from London south to the coast, offered no passage, and the Jutes were confined to a little corner for the lack of thoroughfares into the interior. Then came the Saxons, the fiercest of our German ancestors. They overran the open places about Salisbury plain, but, unable to penetrate into the interior, they paused for awhile. Last came the Angles, who landed on the eastern coast at the mouth of the Humber river, and on that stream and its tributaries found easy access to the very heart of Britain. They at once became the leading tribe of the three, were the first to rise to importance, and hence it is that Britain became not Jutland nor Saxonland but Angleland, the land of the Angles who had settled the greater part of it, who had been able to do so because of the ready access that the highways of the Humber gave them to the interior. Afterward the Saxons, great fighters, overcame the Angles, but the latter had already made their impress upon the nascent nation, giving it their very name, England. Suppose that the Saxons instead had found quick passage to the heart of the country; they would have been the dominant tribe from the start, and we should have had "Saxonland" instead of "Engleland."

And so it has ever been. Wherever highways have led men to pass to and fro, wherever the tides of human life have been freest to flow, there has followed the most rapid improvement, enriching of the country, uplifting of the people, advancement of all material and intellectual interests.

If, then, highways are of such indispensable aid in the development of a country, how comes it that we have such miserable roads as disgrace most of the counties in the Union? The answer is not far off. When the Union was young it was formed of little more than a ragged stretch of settlements along the sea-coast. Soon the tide of emigration that had already overtopped the Alleghanies rapidly filled the Ohio and Mississippi valleys. Statesmen began to tremble for the safety of the Union. The country was growing too large, they said, for one republic; one government could not control such widely separated sections, cut off as they were from each other by mountain ranges and numerous rivers. Hence the wise men of the day said that there ought to be three republics in America—one of New England, one of the South, and one of the West. But about that time the bounds of the nation widened by the Louisiana purchase until they almost touched the Pacific, and people began to feel pride rather than fear in the vastness of the public domain. A patriotic national party appeared—the Whig—which had for its ideal the union of the distant North and South, East and West, into one common, great republic, whose destiny was to make its boundaries conterminal with the continent. With this grand idea to inspire them, the Whigs enthusiastically pushed forward the policy of internal improvements. By means of canals and of roads the remote parts of the country might be made accessible and the distant ends drawn near together. Under the leadership of Clay (later J. S. Rollins here in the West was a worthy disciple of the great Kentucky commoner), the nation undertook to open the interior to development by means of improved roads.

But in the midst of the great scheme of national road-building, railroads appeared. Journeys that before were frightful shrank to pleasure trips; time became of little consequence; the cost of transportation for long distances became comparatively inconsiderable. The Mississippi valley held thousands upon thousands of rich landto be had for the asking. Land was so cheap and production was so much cheapened in consequence that the tax laid upon the producer by poor common roads was unfelt, especially when American enterprise and often American recklessness followed with the railroad closely upon settlement. The railway came too soon; it led to the abandonment of the common road; the importance of the latter was forgotten. But to-day, in the case of railways, the supply outruns the demand. In general, there must be a further internal development, possible only through improvement of the common highways, before there is demand for further extension of the iron net-work. Further shortening of the route from farm to market must be found in an improvement of the road between the farm and the shipping station. Notice the change in the character of farming following upon the gradual settlement of a country: At first, land is cheap, farms are large, crops are raised, as it were, by the wholesale. As land becomes more valuable, farms are divided into smaller holdings, greater attention is paid to the minutiæ of farming. Another step, and with the growing competition yet more careful methods of cultivation are needful. The change goes on until in a thickly settled community we see no longer farming but gardening.

But with the decrease in the size of the farm comes a relative increase in the cost of running it. A wholesale business can be run on a cheaper scale than a retail. So long as farms are as large as counties, so long as crops are measured by the ten thousand bushels, the relative cost of carrying grain to the market is small; but when the farm and the crop are small, any expense is proportionally greater; so that one can not afford to farm on a small scale unless a market is right at hand, or (what is the same thing) a good highway leads directly and easily to it. To-day farmers pay as much or more to haul their crops to the depot as it costs from the station to the distant market; and "good roads—even good dirt roads—would save one-half of that; while a good permanent road, gravel or macadam, would make the real cost of hauling less than one-fourth what it now is." (J. W. JENKS.) Railway rates are about as low as they can be until the railways have more freight to handle; few railways are making even a reasonable interest on the capital invested in them. Further improvement of the situation must, if at all, be made in the common roads that feed the iron highways—roads that have hitherto been neglected because of the supposed greater importance of the railway, but which are just as important to the full and free development of the State.

Look at the human body. The blood, charged with life, rushes through the larger channels to the different members of the body. From the arteries it passes into the capillaries, tiny tubes that ramify through the flesh, touching every fiber of every muscle. Through them the blood is brought into contact with every tissue in the body, and imparts to the exhausted flesh new life. Check the circulation of the blood through any capillaries, and that part of the body becomes lifeless. However actively the blood may flow in the arteries or in the veins, it fails adequately to refresh the wasted fibers, the body is seized with torpor, and growth is checked, perhaps life extinguished. Just so with the body politic. It is not sufficient for the life-blood of a nation, the currents of traffic, of social, political, intellectual and moral life, to flow in full tide only where the railway has opened a channel. The life-giving stream must permeate the whole State, must penetrate the country townships, must sweep by every homestead. Only under such conditions may the State expect full and perfect developement.

In colonial times there was a striking contrast between the New England and the Southern colonies. The unit of political life in the North was the township, in the South it was the county. In the North people collected in little villages, with their farms lying close around, or in towns or cities; in the South there was a class of great planters, each living on his plantation a petty king in his little kingdom, monarch of all he surveyed. From the Alleghany mountains rivers ran to the sea, forming a succession of obstacles to travel from north to south or from south to north. There were no great towns, because lack of highways checked all trade. We find that New England, busy, energetic, inquiring, self-reliant, self-governing, educated in politics at the local town meetings, in spite of a niggardly soil and an inhospitable climate, rapidly advanced in all material, social, intellectual and moral interests. In the South there was no such prosperity, at least, no comparable material prosperity. There was no development of the resources of the section. The people, living each to himself, were not spurred on by association with one another, by rivalry, by competition, by the play of mind upon mind. They contentedly let the world wag on as it chose. To-day, though the South is being rapidly developed, it is still suffering from the habit of ease that has all along characterized its people. Difference of climate has much to do with difference of character found in the two sections; but difference of modes of life, that means much. This reference to history shows how much more rapidly a community or section advances in all the elements of civilization when its people are brought into close association with one another.

The rapid progress of the New England colonies shows especially the material prosperity following upon free communication and free exchange of ideas between communities, though in it we see, too, with scarcely less distinctness, a wonderful advancement in intellectual and in moral force. Let us consider in some detail the advantages of such closeness of association among a people. Man, says Aristotle, is more social than bee or ant. His nature, his instinct, more than theirs, craves the company of his kind. In older days, when people thought that they could win the favor of Heaven by torturing themselves, pious men used to wear rough clothing to chafe the flesh; they used to flog themselves till the blood ran down their backs; they would starve themselves until the hollow cheek and sunken eye proclaimed them martyrs to the faith; but above all they would withdraw from their fellow-men to live in solitude, accounting it the greatest service to God if they denied themselves the pleasures of human intercourse and human sympathy, repressed the natural longing for society and lived alone in communion with God. The hermit was esteemed a thrice holy man because in forsaking the companionship of fellow-men he had trampled upon his human feelings and stifled the craving of his human nature, had thrown away the most precious joy of earth in hope of the joy of Heaven. Few men, however, can be hermits. Men in general will to the end of time remain social animals. Those communities will be the most prosperous and happy where there is the freeest communication.

What are some of the specific advantages that would follow upon the improvement of common roads? (1) Markets would be brought nearer, land thereby increased in value and in comparative productiveness. (2) Meetings for political purposes would be more easily assembled, and political education, much needed, would be more widespread and of higher grade. (3) Voluntary meetings of societies for discussion of political, literary or social topics would be more frequent, adding greatly to the horizon of those participating. (4) Schools would be more accessible and schooling more easily obtained. (5) Life on the farm would be fuller of social pleasure.

The third and fifth items noted above are worthy of closer attention than may at first be thought, They mean the improvement, intellectually and morally, of the members of the farming classes that will and must follow their closer association with one another. If it is true that man's highest development is reached only when he joins hands with fellow-man in united effort, mutual rivalry, constant aspiration, then, for the best interests of the farming masses, make good roads make passable roads, that will bring them close together in their everyday life. As it is, Sunday is almost the only day that country people meet one another, and then, perhaps, only once a month, on preaching day. Sunday school is given up—roads too bad. Again, look at colonial New England; see there the working of the craving for social life and pleasure that must be gratified if men are to be men, men of expanded and expanding minds and hearts. Although in New England intercourse was much more free among the people in general than in the South, yet there was not enough to satisfy the natural desire. The people were laboriously wresting a rugged domain from wild nature and wilder beasts and savages. There was no time for social life. But their church meetings were well attended. We understand, of course, that the Puritans were earnest churchmen; if they were not, fines by the court often made them so. Yet, I venture to say that it was not altogether the religious duty felt that brought them to the chapel. It was not altogether delight in sermons that made them willing to sit in their bare-walled houses of worship through three hours of solemn, painfully earnest, monotonous service, listening to the dogmatic harangues of their spiritual leaders.

One good reason for the popularity of the religious service of those days is that at the church, and at the church alone, the people found food for their intellectual and social natures. The sermons were their intellectual food, church gatherings their social meetings. The mind craves to be fed. It will delight in dryest discourse if nothing better is offered. So in early times the people flocked to church as to a lecture. It is the same in the country to-day. Country people are more regular and more interested attendants upon public worship than city people. It is in part because the church offers them their only meeting place for social and intellectual culture; and everybody goes, saint and sinner. I repeat, that this enthusiastic attendance upon religious service arises in good part from the social and intellectual needs of the people, not altogether from their spiritual needs. It shows that the people in the country are starving for such food. Life in the country, though not so bare and unlovely as the life of the Puritans, is yet dreary, uninspiring, sometimes unbearable. Hence, most of those that are born on the farm gravitate to the city, not because they despise the farm work or the country life in itself, but because they cannot find in the country those social enjoyments and intellectual advantages that they expect to find in the city. It is not the laboriousness but the loneliness of country life that drives them to the city; men must work, in city or in country, and one kind of work is as severe as another. "God made the country, and man made the town," and I had rather live and work in God's country than in man's town, but I do not want that life to be the life of a hermit. Nor does the farmer himself wish it so. Country people have hearts just like other people—only bigger—and minds just like other people; and they thirst for social and intellectual pleasures.

It is the crying evil of the day—this rush of the people to the crowded city. In the sharp struggle for existence there many are crushed, and many driven to disreputable means of living. Thousands that would lead sober lives in the country are lost in the city. The improvement of the surroundings of country life that would follow upon the improvement of roads would tend to check this emigration to the crowded city. What that would mean in the uplifting of the average of morality and in the progress of the nation cannot be computed. In the country is found, as has been over and over said, the strength of the nation. Let not that strength be drawn to the cities and there turned into weakness. The best life, the highest happiness, the grandest attainments of the race, can be achieved only when the country districts are brought into close and ready communication with one another and with the outside world, by means of good, permanent highways branching off from the railways, and affording an easy channel for the currents of life in all its phases to reach and refresh the now hidden corners of the land.

PUBLIC ROADS.

[The following excellent paper was read before the Farmers' institute held by the Board of Agriculture, in this city, on January 14, by Mr. A. J. MOSER, of Pilot Grove township. The deep thought and sensible suggestions it contains come from practical knowledge of the subject, and it is worthy of careful study.—Tipton Times.]

Public roads are an index to the prosperity of a country. An energetic and enterprising people will make persistent efforts to improve the highways of public travel. Good roads constitute a part of the wealth of a community. They are of as much value as good buildings and other commodities. Bad roads are not only a source of annoyance and aggravation, but of great financial loss and waste of time. They exist at the expense of good-naturedness and wealth. They develop rough and unmerciful drivers, increase the wear and tear of our vehicles and prohibit us from bringing the products of our farms to market when we could realize the best prices.

Man adapts himself to conditions or environments. When our prairies were a public stamping ground, people did not give much thought to road-building. If one trail got impassable it was no trouble to start a new one. Road-working at that time was a sort of social gathering for recreation and amusement. Fifteen or twenty men would mount their "nags," axe in hand, and ride eight or ten miles a day, stopping occasionally to cut a few brush and throw them into a ditch, and imagine they had done a good job. When immigrants from the more thickly settled Eastern states, where a more complete system of road work had been developed, arrived in Missouri, they were partly amused and partly aggravated by the prevailing style of road work. But it is altogether probable that had they been among the first settlers, they would have adapted themselves to the conditions that existed at that time, and enjoyed the sport of a road-working party with their neighbors.

Conditions have changed. Our prairies are all fenced and roads permanently located. Barbed wires and hedges from four to twenty feet high mark the boundary of man's travel. A new system of road work had to be adopted, which consists principally of plowing and scraping. Judging from the condition of some of our roads, it would appear that we have not struck the right plan yet. The great problem that confronts us to-day is to develop a system that we are able to bear.

As far as I have learned, there are three methods proposed for improving and completing our roads. The first of these methods is to thoroughly grade the road-bed, so that all the rain will speedily drain off into ditches cut from one-and-ahalf to three feet deep. This would be carrying our present system toward a state of perfection and would give us what are commonly called good "dirt roads." The cost for complete work of this kind is estimated at from fifty to seventy-five dollars per mile.

The next method is to build rock roads. A solid rock bed, about eight inches thick, covered with gravel, would complete the job. Our hills and bluffs would furnish the stone, and our creeks the gravel in abundance. Such roads would admit of heavy hauling the whole year round, and would practically last forever. Judging from the experience in other sections of the country, it would cost at least two thousand dollars to build a mile of first-class rock road.

Last, but not least, it is proposed to cover our roads with roofs to keep off the rain and snow. Sheds similar to the snow-sheds built over the railroads in the mountains, would be sheltering our lines of transportation and communication. That would most effectually do away with mud and mire. We could all go to town on rainy days, but it would spoil the sleighing. It is claimed that these sheds would cost less than rock roads.

Since the first method will have to precede the second and third, to lay the foundation, I will limit my remarks to that, hoping that others present will take up the rock road and shelter plans and show their practicability. My topic, then, is common graded roads. It is evident that our roads will have to be graded before they are fit to be macadamized or sheltered.

The rule, that what is worth doing at all is worth doing right, is applicable in grading as well as house-building or any other work.

Common graded roads, when built right, are quite serviceable. They can be made to stand a great deal of wet weather without getting miry. But, as a rule, they are not built that way. A few shallow furrows are drawn along the outer edge, and a few scraperfuls of clods are dumped here and there or a big "thankyoumam" is thrown up, and then the thing is left to Providence and public indignation. What does a little bit of scratching on some hot August day amount to where the road is several feet lower than the adjoining fields, and gradually sloping from the edges toward the middle? This style of road-work has been tried in many places for the last twenty years, and the result is, mud-holes. What is the use of scattering the work here, there and everywhere, not leaving a trace that can be seen six months later? Either do nothing or do the work completely. It can not be done all at once, but let that which is attempted be done right. In course of time we will get around. Since road-work is performed according to statute law, it should also be done in accordance with natural law. The blind ditches which are made in many parts of the country have revealed a law of drainage that can give us valuable hints in road-building. A ditch two feet deep will drain to a much greater width than one of six inches depth. A road graded with due regard for this law will be high and generally dry. No man should be elected as overseer who is not fully aware of the fact that water runs down hill, even under ground.

Another important point in road matters is the time in the year at which road-work is done. As a rule, one day's work in the spring is worth two days in the fall. Road-work should commence as early as March and April, and all grading should be finished up in June. Roads properly graded in this period will settle and become firm. The work is much easier done than in the dry part of the season. In the early spring, ditches may be plowed through gravel where dynamite would have no effect in August.

A deal of work in the right time of the year is what it takes to make good roads. The happy time has passed when road-work offers an opportunity for recreation and pastime. We must get down to solid work as though we were digging for gold. A community of people generally gets what it deserves. If we take but little or no interest in public roads, we will be punished by mud-holes. All we can do is to grin and bear it until we learn better.

It is true, we are met with one great difficulty in keeping our roads, and that is that condition of our soil that causes it to be washed away in great masses by the heavy rains. It requires eternal watchfulness to improve and preserve our roads. Here, as elsewhere, "an ounce of prevention is worth pounds of cure." If there are those present who have ever spent three hours outside of regular road-work days to open outlets and ditches to prevent the road from being torn up, I would say to them, keep on in the good work; your reward will be great; you may in course of time be called fools and cranks. The majority of us consider the public road a very convenient place to deposit Osage orange brush, old rails and stumps. Of course we make ourselves liable to a fine, but the overseer is generally a good-natured fellow. He will have the rubbish cleaned away at the expense of the district, or more probably he will let it alone.

The truth of the matter is this: If every farmer would spend a few hours occasionally to remove stumps or rocks and open ditches and outlets to prevent a wash-out, our roads would soon be in a much better condition. But we don't care. We think it is the business of the county court and the overseer to look after our roads, and we don't propose to waste time to make nice traveling for other people. We may be aware that the water is about to break over the road somewhere along our farms, and it could be stopped in fifteen minutes, but let her go, the overseer may fix it next year. When next year comes there is a ditch washed in the middle of the road fifteen inches deep and fifteen rods long, an inch and a rod for every minute it would have taken to prevent it. It takes a whole force of hands and teams several hours to repair the damage. The consequence is that other bad places have to be skipped, and we never can "catch up." Whom are we to blame for the condition of our roads? Nobody but ourselves. We have all been too selfish, too careless and lazy to deserve good roads. I gladly admit that there are exceptions, but as a rule we only work to get our receipts, and it would worry us like the mischief to devote a few extra hours to public benefit.

"Hold on," says one, "you are too fast. Farmers are hard up. They have to put in every minute of time on their farms to make ends meet. Our town people might help us along a little, for they reap the benefit of good roads as well as the farmer."

This a pretty good idea. Let us see if we can get anything out of it. A few months ago I met a farmer at our county seat who was going around among the merchants and other business men of the city to take subscriptions in money for the purpose of grading a certain road. The farmers along that road had all subscribed liberally, and it appeared that the city people were not backward. The prospects were that the road in question would be greatly improved. Now what is to hinder us from carrying out this plan everywhere, and at least get our main roads in a condition that when the rock road and shed men come around, they will find a foundation worth building on. I imagine that our wealthiest men are already loosing their purse-strings, and will closely watch for the opportunity to "chip in."

At any rate, permit me to say in conclusion, don't let the grumblers get discouraged. Grumblers are disagreeable, but they keep the waters of life from stagnating. The world is moved forward by those people who are dissatisfied as long as there is anything wrong that might just as well be right. It is through the tempest of thought and agitation that progress is made. The dead calm of ignorance and indifference would forever leave us in the old ruts.

COUNTY ROADS.

[An address by E. E. COLBY, civil engineer, Springfield, Mo., before Farmers' institute in Hillard, Missouri.]

The limited time for the preparation of this paper will not admit of an exhaustive statement of the subject, and only a few of the points will be touched briefly. County roads under any system should be divided into three classes, viz.: main roads, important local roads and ordinary local roads. The main roads are arteries leading to the principal market, beginning at the remote corners of the county and increasing in importance and traffic, and they are intersected by each succeeding local road. There should be at least one from each of the cardinal points of the compass, and later, as the traffic demands, one over the most practical route from each intermediate point. The location of these roads should be upon the section line as near as practicable, more attention being given to their permanent location, so that the money and labor expended will not be lost by a constant shifting. At least 60 per cent of the money and labor of a district should be expended upon the construction of these main roads. Building each season one piece of road, and making the work as permanent and durable as possible, would, even under our present system of a half holiday, finally make one good road in each district. In the location of important local roads, something like the same rules would apply as to the main roads, making local towns the center of the system and paying more attention to a permanent location. In the location of ordinary local roads, or neighborhood roads, for convenience of schools, churches, and social relation, the desirability of frequent change, as the country develops and becomes more densely populated, would suggest that as much attention be given to convenience as possible, and that they be located on the best ground available, with a view to the least possible expenditure for their construction and maintenance. That road is the cheapest which affords the least wear to its own surface and to the vehicles combined. Experience has shown macadam to be the best wearing surface for county roads.

Elaborate experiments have been made by Morin, MacNeil, Rumford, Gordon, and others, to determine the force required to draw a given load on various surfaces. The results agree fairly well, and show that the force is from 1-20 to 1-133 of the load, depending on the surface. The result of the experiments, as regards the relative value of macadam and earth, is as follows:

Macadam, force required to draw one ton	100 lbs.
Earth, force required to draw one ton	200 "

Therefore it will be seen that if all our main roads were macadam, the force required to draw a load over the same road would be only one-half of that required to draw the load over earth. The importance of these facts is but little realized, and in the absence of accurate statistics as to the number of vehicles, the amount of tonnage, and the distance traveled, it is impossible accurately to demonstrate their effect; but if the saving in transportation is proportional to the load carried, it is safe to say that at least one-half the cost would be saved by substituting macadam for earth, and the saving over our present roads would be enormous.

The cost of wear of vehicles is also to be considered. A farmer will pay several dollars for repairs of a wagon caused by marketing produce over a rough road, and continue to pay from the same cause, attributing it to bad luck, but would probably consider it a hardship to pay the same amount for a road tax as a preventive. A writer in Harper's Weekly advocates a system by which the roads in each State might be placed in charge of a State engineer, the repairs in each county to be made by the county surveyor, or according to the instructions of the State engineer, a uniform road tax of five mills to be levied throughout the State, but the amount of taxes raised in each county to be expended in that county. With a valuation in Greene county of $5,230,000 (exclusive of city property) for 1891, such a tax would yield $26,150 per annum for the roads of Greene county, and this sum judiciously expended, according to well-digested plans and under competent supervision, would in a few years build nearly all our important roads, and maintain them in good order. The present system of independent action, or inaction, is known to be a complete failure. What it costs for the entire State cannot be stated, for there are no statistics on the subject, but for the year 1889, for Greene county, it was as follows:

Labor expended, $12,820.41; cash expended, $6,257.87—making a total of labor and cash expended of $19,078.28. There was also labor delinquent $2,637.05, and of this total amount expended, $3,831.29 was for superintendence or overseers, although the result was almost nothing.

In brief, then, the only system for good county roads, as shown by universal experience, is a bed of stone broken into small, angular fragments, and thoroughly rolled and maintained in good order by a small force of laborers, under proper organization and supervision, constantly at work, summer and winter, in cleaning off the road and repairing any defects the moment they appear; to which must be added from time to time, according to the amount of traffic and resulting wear, a general renewal of the road surface with the same materials.

In conclusion, under our present defective system, a great deal of good could be accomplished by intelligent work. Drainage, for instance, is a very important factor. Make good ditches on each side of your road through wet and swampy ground. If you are going to grade a piece of road, and have little labor or money, don't make your road too wide, and be careful that the sides of your crown are lower than the center, so that the drainage is from the center of your road and not to it. On side-hill slopes make your ditch on the upper, not the lower side, so that the storm water will be kept off of your road and not wash it. When there is a depression of the surface just after washing the summit of a hill, make a ditch along the sides of your road until you reach the slope, and not maintain a mud-hole on top of a hill. If the present system is continued, it would be well to hold frequent meetings of all the road overseers and discuss the best methods for work, thus naturally profiting by the experience of others.

COUNTY ROADS.

[An address by ALLEN CLARK before the Farmers' Institute held in Franklin county, 1891.]

MR. CHAIRMAN AND GENTLEMEN—I have been called upon to take part in the subject of "Country roads." While I know something of it, I feel there are others of better knowledge and a wider range of experience that doubtless could do the subject more justice; but, having been called upon, I shall render such views as I have formed from study, observation and experience.

The present road law of our great State, while it may work well in some counties, is terribly at fault in others, and especially in the rough ones. It might be well to divide the roads into State and county. Let the State roads be run upon the best practical routes, about so many miles apart, and touch as many of the county seats, important cities and towns as practicable.

We have now in our State penitentiary over 1,600 convicts, men and women. The convicts are leased by the State to different manufacturers for various purposes. Average number employed is 1,122, at about fifty cents per day.

Now, gentlemen, where do these products of convict labor go? Into private use? No, but out of the prison walls into the general market to compete with yours and every other mechanic's labor who has a family to support. This is not right, for the labor costs the lessees comparatively nothing, and the mechanic who has everything to buy, house rent or taxes to pay, and all the necessary expenses incident to private labor, has to come into the common market in competition. We might remedy this. Divide our criminal cases into divisions; all of a certain nature, say five years and over, make penitentiary; under, county jail, with the exception of city of St. Louis, whose jail cases should be provided for; distribution among the counties would do. Now, keep enough convicts (the hard cases for one lot) of the penitentiary class inside the walls to manufacture the clothing, shoes, tools, etc., for the rest. We will divide the convicts, except such as are referred to, into companies or gangs, and put them to work on the State roads referred to, each gang having its own outfit as regards guards, cooking outfit, etc.

We are now accomplishing three things, viz., stopping competition, securing a lasting benefit and furnishing labor to a troublesome necessity, besides furnishing a temporary market. If the latter should be found objectionable, let the State lease or buy a tract near some railroad, and put in some convicts, as is at present done, and furnish the most desirable articles. Then, as these roads are completed, let them be turned over to the respective counties through which they run, to be kept by them in repair.

We now come to our county dirt roads. We have spoken of our county jail convicts, and it is here we will use them in connection with the regular county workings. Let the several county courts to whom these convicts belong, or are divided, with their labor build consecutive roads, intersecting these State roads.

Now come our regular county workings, and in this connection I must say that the present mode of selecting one man at the annual school meetings to work and manage the affairs of a certain road district formed by the county court out of a number of school districts is wrong in various ways, the worst of which is incapacity, an undue proportion of territory to the amount of labor contained therein, too much option as to manner of working, and wrong time in which to do it.

Road-working in all its forms has certain principles that are common under all circumstances, but modified to suit different locations.

These principles are not as a general rule easily acquired, unless by study or continued practice; hence the need of a capable person to fill the position. Under our present law, few districts contain such persons; it should be some person appointed by the courts, known to possess the necessary qualifications, and in case of failure to possess them to be removed by the power that put them in.

Then again the term of office is too short; a man is chosen every year on the first Tuesday in April. He may be a man capable of filling the office, but from causes of dissatisfaction to some of his constituents, he is defeated at the next meeting. The roads may be in bad condition in his district when he enters his office (which they undoubtedly are), and he has laid such plans of caring for them as will, in a few years, insure success, but owing to his defeat some one else takes hold, his plans are defeated and the good is all lost.

Now as regards the territory, it is nearly as bad. Take our prairie counties; it is not as bad as in the rough hills and mining regions. In a prairie county the population is greater, and consequently there is more material to work with, and from the nature of lay of land in general, does not require so much attention.

On the other hand, you take the rough counties; there are vast bodies of land, owned by single individuals, and not an inhabitant living anywhere near. Here is where work needs to be done to keep anything like passable roads; no men to do it, and worse than all, a very small amount of money to do it with.

Again, there are tracts owned by widows and orphans who are minors, also women who manage their own matters. I speak this from personal experience. The remedy for this evil, and in fact the whole road system, in my judgment, is a tax of so much on the $100, and then give the money to the various persons entrusted with the work. That land that was rough, although so, has an assessed value, even though it is uncultivated, and in a great many cases belongs to parties who are non-residents, and holding for speculation. If this, as well as all other property, was taxed a certain amount on the $100, making an amount equal to the present $4, or such amount as the county courts require for a year's labor, apportion this to every 80 or 160 acres for one holding, and then give this money to the various road overseers, we would commence to see a new era in road-work and roads.

Of course, by an arrangement of this kind, there would be a certain class that would not be reached; but provision can be made that any one owning no realty, but of age, shall be enumerated by the clerks of every school district, and forwarded by them to the person in charge of the work, to be called out something similar to the present method, but in case of failure to report for duty, make it a misdemeanor subject to immediate arrest and imprisonment in the county jails or compulsory works. The present law is too loose on this point, and in nearly every particular impracticable. The time is too long before it can be enforced, and in the end you have nothing but a judgment. It is a common expression "going to kill time," and, gentlemen, it means what it says, and I am sorry to say that in a great many instances it's a reality.

What's to be done? The overseer can say nothing; "a reasonable day's work," and you are at the end of your rope. But on the other hand let him have the money and hire his men. In such a position he can say, "here's your money, I need you no longer." Then again, the time an overseer wants his men is when the farm work is pressing and things need attention, and they go unwillingly, never thinking they are being benefited thereby as well as others; these same parties generally being the first to howl "bad roads."

I have given you my views as briefly as possible, not so much so, I hope, as to be misunderstood, but I do think and can see no better plan than for our State authorities to pass such laws as to make use of our convict labor on some leading roads, macadamizing them as they go, and a network of county roads intersecting them, worked by taxation. We may then look for our uncultivated lands to be taken up, and we receive a portion of the immigration we deserve; but above all, do not let us have any more "bonded contract work," or we need not look for any immigration.

Thanking you for your kind attention, I shall leave the subject for you and greater minds than mine to work upon.

AGRICULTURAL EDUCATION.

A SERIES OF PAPERS PRESENTED AT THE FARMERS' INSTITUTES HELD BY THE STATE BOARD OF AGRICULTURE.

EDUCATION AND AGRICULTURE.

[Written by Prof. L. A. MARTIN, School Commissioner of Livingston county, and presented at Farmers' Institute held by the Board of Agriculture.]

Education, as understood, is at present considered apart from any physical results. To fill the brain with facts, with theories or assumptions is about all we attempt. Results we expect, but while the instructions are imparted they are not considered. Their coming is a matter of chance, a problem of probabilities, like "bread thrown upon the water" at the mercy of the drifting tides. But the expenditure required to maintain our schools is no matter of chance. The State of Missouri spends annually over $5,000,000 in the work of education. Looking at this as a business proposition—and no business venture is made without a keen eye to results—we might ask, what is produced by this vast expenditure?

Has it added to the material comfort of the people? Has it in any way increased the food supply, produced increased happiness or dissipated misery? Has it made the homes of the people happier or more beautiful? Has it helped in any way to develop in the rising generation a sturdier, more industrious, thriftier or more honest type of citizenship than that which is now passing off the stage? Has it inspired a stronger love for home life, or for the useful trades, or the necessary vocations? Not to any flattering extent. The curriculum of our common schools does not extend farther than teaching our pupils penmanship, reading, arithmetic, the fundamental facts of United States history, civil government, English grammar, physiology and descriptive geography.

And in these the work is often without system and superficial. But granting to it system and thoroughness, what is the pupil prepared to do when he has completed it? What vocation in life is he prepared to enter? Except the acquirement of a few mathematical principles, grammatical rules, a stiff, scrawling chirography and a number of historical dates, what else has he learned by his stay in the common schools? Has the instruction given therein been to any extent a practical preparation for life? All that the pupil has acquired by his five or six years' application in our country schools is the knowledge of facts contained in books—text-books, foolish conglomerations of abstractions, with no practical bearing upon the problems or exigencies of every-day life.

But this book lore that he has acquired is to a great extent worthless. In beginning the study of grammar, he was told that "English grammar teaches how to speak and write the English language correctly." But has he learned that from his study? Does he even know what the term "English language" means? Does he know of Shakspeare, Milton, Chaucer, Spenser, Goldsmith, Burke or Macaulay? Has he learned aught of the philosophy of history or biography? Does he know anything of contemperaneous literature or events? Has he even been required to read intelligibly one work in literature, history or science outside of the dull text-books of the course? Has any taste for good literature or ability to write or compose good English been imparted? In most cases not even a suggéstion. The greater number of the pupils of our country schools have never read a single English classic, and the same criticism might apply to the teachers. Their minds have never been led to wander through the blissful land of treasured thought, where the mighty of mankind labored, where, under the influence of that light that "ne'er was seen on shore or sea," they wrote down their inspirations and transmitted them to posterity in the unsealed treasury of good books. Not even a taste for such has been imparted; so from a stand-point of culture, as well as practical utility, the instruction given has been to a great extent a failure.

But this impractical and superficial instruction imparted in our common schools is open to another criticism, severest of all. Children thus taught have a false notion of life. They seem to despise the nobility of labor, and to seek more uncertain means of obtaining a livelihood.

Parents seem never to think of teaching their boys a trade or useful vocation, but leave that important step in life to chance or self-adoption after they have reached maturity. It is a common complaint that all our common schools qualify pupils to be is teachers, and that of a very inferior grade; and parents in the country, as a rule, are disposed to discourage an education which they know will only lead their brightest boys away from their homes, make them disinterested in the onerous and healthful labors of the farm, and eventually lead them to the city, where they seek prosperity by following a fleeting will-o'-the-wisp, and where in most cases their efforts end in bankruptcy and moral ruin. Can they be blamed for this? How many instances have come under your observation where prosperous farmers have become bankrupt by backing their inexperienced sons in business ventures in the city? Do we not hear from all sides the universal complaint, "farming does not pay;" that farm products have depreciated; that all our young men, ambitious of fortune, take no interest in its pursuits and are ever watching opportunity to enter other vocations? That the fascinations of city life attract them, and that they are everywhere leaving? Such is indeed too true. They go, despite the true admonition of the old ballad:

You're starting, my boy, on life's journey,
  Along the grand highway of life;
You'll meet with a thousand temptations;
  Each city with evil is rife.
The bankers and brokers are wealthy;
  They take in their thousands or more;
But ah! there is gold on the farm, boy,
  Don't be in a hurry to go.

Why is this? Simply because the whole influence of our education, all force and example, is against farm life. If all the instructions now given in our common schools have any purpose at all, that purpose certainly lies outside of manual labor or work on the farm.

That purpose lies in the soft-handed professions or in the trumped-up quackisms of fashion. All the instructions given in our common schools during the last twenty years have not produced one good farmer or mechanic. The good farmers and mechanics have been produced by instruction and influences outside the school-room. Nor can our schools claim the honors of invention. All inventors come from the bench, farm or shop, and most of them, in what is commonly termed education, are very lacking. All that our schools are successfully producing are lawyers, doctors, teachers, book-keepers, agents, clerks, accountants, type-writers and cultured loafers. This will always be so as long as we educate the boys and girls away from the home instead of back to it. Instead of teaching the boys and girls to return, when they have completed their work in the schools, to their old home and spread the sunshine of their acquired culture among its simple and cherished inmates, and its benefits in beautifying the surroundings, making its rooms ample and better ventilated, its walks more regular, its lawns lovelier, its fields more fertile, its orchards and gardens more productive, we teach them by the strongest incentives to seek a field of effort in some of the callings just named.

Now, if those callings are of greater utility to a state than that vocation which furnishes the entire food supply of its people, our present theory of education is correct, and the State is justified in making the vast expenditure it does to maintain it. But if such is not true, our theory is all wrong and should be corrected.

This brings me directly to my subject—Education and Agriculture. I maintain that it is the duty of a state to provide the means of a sound, practical elementary education for all its people, but that education should have a special and direct application to that vocation in life which the vast majority of its citizens must of necessity follow. Applying this principle to modern education, we find that the reverse is true. About 1-300 of the population of the State are teachers. Yet, for their professional education, the State maintains four normal schools and one University, which is only a normal school of a high order, and also the hundreds of high schools throughout the State. About 1-1000 of the entire population of the State are lawyers, yet the State maintains a college of law for their benefit, and other colleges maintained by other means are opened for students, while every law office is, in a certain sense, a law school.

In medicine likewise the State has made ample provision for students. But in agriculture, the vocation that two-thirds of the people of the State are engaged in as a means of livelihood, the State maintains only one school, a school that is isolated, unknown to fully two-thirds of the people of the State, that has had to contend with opposition and jealousy from every hand, that on account of its being connected with a school of the highest grade in the State is absorbed by it, and ignored by the students, that has had in its entire work of more than a dozen years scarcely a dozen graduates, not one of whom so far as I have heard has become a farmer. This fact, used by its enemies to influence the cupidity of a parsimonious legislature, had its effect. Whatever appropriations that it demanded were grudgingly given. The results of its labors were under-estimated, and its purposes held in contempt. Its defenders met the common fate awarded to reformers through all times, and the trite lines of Goethe to their case fits exactly:

> "'Who for humanity have wrong defied,
> Have e'er on crosses or on scaffolds died."

Agricultural education is a new idea, but in full harmony with the fundamental principle of civilization, viz., the elevation of the laboring class. The nations of antiquity built their civilization upon the degradation of labor. The tillers of the soil were slaves. This condition held sway through the dark night of feudalism, and, down to a very recent period in the Old World, the vast majority of the tillers of the soil were mere serfs or tenants at will. The masses were ground down by oppressive terms, so as to preclude all efficient cultivation. Sunk in the grossest ignorance, groveling in superstition, their law the will or caprice of their landlord, the people had neither means nor will to improve their holdings or methods. Only the crudest instruments were used. Iron plows were not used till 1731. A society of caste feeding upon extortion struggled hard to maintain its supremacy and perpetuate the serfdom it had imposed upon agriculture.

But the discovery of America, opening to the world a vast unbounded field of virgin prairie, forests, groves, hills and mountains, with the richest soil, free of tenure, marked a new epoch in the agricultural progress of the world. The hardy pioneers who braved the ocean would brook no interference with their holdings. Among them was no caste: they were the rulers of their primitive settlement, as well as the tillers of the soil. This gave a new dignity to labor.

But as population increased the scions of aristocracy began to diffuse its principles; though not successful, still the sentiment was covertly believed and taught, that the hand that holds the plow or drives the plane is not as honorable as the hand that has never grown horny from the blistering sunbeams and the friction of manual toil. To this class belong those who oppose the efforts of agricultural education. But they are linked to a dying barbarism that is now throwing its last shafts at the sun of an endless progress, and we need not fear their power. All we need as educators, as citizens, as patriots, is to be bold; to say boldly to the world that the principles of scientific agriculture shall be taught in our State, not only in *one* college, but in many—not only in many, but in every country school in our beloved commonwealth. It should not only be taught theoretically, but also practically by scientific experiments. Of course the method of putting this into practice is a great problem, without precedent, perhaps, in the history of the world. But this grand nineteenth century civilization is without precedent, so it is not necessary to argue precedent in behalf of an enterprise whose object tends to the financial as well as moral improvement of over two-thirds of the people.

I maintain that the principles of scientific agriculture should be an important part of our educational work and taught in every country school in the land. It should be incorporated in the course. Many methods might be suggested, but I will offer the following: First, by text-books; in every country school there should be taught the principles and facts of agricultural chemistry. These principles should be engrafted in a text-book, not too elaborate, but simple, free from puzzling technicalities and elementary in design. I know of no notable work of this character, but one could easily be prepared and made a part of the course of study. Its suggestion is recommended by reason. "The object of agriculture is to develop from seed and soil the largest possible value of useful plants and useful animals at the smallest cost." Nothing is more reasonable than that the farmer should understand the nature of those materials which build up his crop. He should know whence those materials are to be drawn, what ones are provided by nature, and what by his own efforts. He should know how to work in harmony with nature in the placing of those materials so as to produce the most profitable results. The work should briefly explain the composition of animal and vegetable tissue, the important organic matters of our staple field crops, the principles of fertilization and crop rotation. These principles need not be stated with lengthy demonstration or elaborate experiments. Simplicity should be the rule. The deductions derived from costly experiment at the experiment stations might be stated.

The rules for planting, sowing or reaping that have been proven by ages of experience should form a chapter. A work in entomology should also be in the course. In the last report of the State Board of Agriculture such a work is suggested. The structure of insects and their classifications are there clearly and logically outlined. However, unless it is taught as a text-book, it is useless to expect any flattering results. The number among practical farmers who will read an article like that, bristling all through with Latin terms, is few. It should be taught in every country school where the insects themselves can be studied. It should treat fully the subject of injurious insects, and how to withstand their ravages.

In a paper from Prof. Purinton, of the Missouri University, published in same report, it is shown that the farmer and fruit-grower should possess a thorough and accurate knowledge of all the insect pests liable to prey upon his crop, as well as a knowledge of the best available means of their repression. The necessity is shown from a financial stand-point. But I maintain that from a stand point of culture it would be fully as profitable as the deformities and jimcrack diagrams whereby most of our teachers endeavor to impart to their pupils a knowledge of English and of grammar.

These two studies (agricultural, chemistry and the elements of entomology), horticulture, domestic economy and the three R's, would in my judgment be an adequate and practical course of study for our country schools. But how to secure it? Teachers would not teach these studies? The purpose of my treatise is merely suggestive. It in no sense partakes of an executive nature. Teachers would not teach physiology till the law required it, but since the law made it compulsory the teachers have prepared themselves in that subject, and it is now taught with more or less effectiveness in all our country schools.

But in this step I would leave it to no uncertain means of execution. Having revealed Delphos, I would essay Olympus. Laws I would modify and qualifications require until I was sure that every pupil in the State would have an opportunity to learn how beautiful is the home of his childhood, how lovely its green fields, how helpful its fragrant boughs, how enchanting the song of birds and low of cattle, how endearing the noble simplicity of country folk, how noble that brow from which the blinding sweat-drops fall upon the harvest sheaf, and that bends in humble adoration before its God by the family altar of the country home.

I would make no doubtful effort. The State Board of Agriculture, with the State Superintendent of Schools, should jointly control the public schools of the State. They should be largely industrial schools. In ethics, in the intermediate grade, the principles of the various trades should be practically taught. This department should be under the superintendence of a practical mechanic. In the country schools, in like manner, the principles of agriculture and gardening should be practically taught.

It is difficult to give a just description of the average country school-house. It is generally a square box frame with no ornaments whatever, and severely lacking in the graces of architecture. Of such there are over 10,000 in the State. They stand alone generally on a square plot of ground, dreary and desolate for the greater part of the year. Wild weeds grow around the door, the fences are dilapidated, and in the fall when school opens, the vegetation that has grown rank during the summer is rotting around, the water in the well is foul with organic matter, and the out-houses are out of repair. The furniture of the room is out of date, cobwebs are on the walls and window lights are broken.

Such are the surroundings that greet the earnest country teacher at the beginning of his labor. And in such a den of bunglesome architecture and neglect, our country boys and girls must lisp the rudiments of an education. No wonder country homes are not more beautiful, no wonder the boys and girls are fascinated by the tasteful decorations of the city, and imagine the shimmering gewgaws of art more truly beautiful than the waving fields of golden grain and nature's shadowy pathway through leafy grove. Is it surprising that our country boys and girls should be somewhat rude, educated in such a rude habitation? Yet in such a place they spend the spring-time of their lives. Common sense and progress should dictate that the scenery, architecture, furniture and environments within and about the school premises should be the most pleasant and enticing that is possible. There should be flowers along the walk and beautiful trees in the yard to furnish shade.

The observance of Arbor Day, so energetically advocated by the present State Superintendent, has caused a great number of trees to be planted in many school-yards throughout the State; but the trees, after being planted, are generally neglected; the yards are not mown during the summer, but overgrown with rank weeds and other vegetation; hence there are few beautiful school-yards among the country districts of the State. It is clearly apparent that there is a need of constant watchfulness to keep in proper repair the school premises, and in country schools to make the instruction practically applicable to the state of life in which the pupils are raised, and in which the vast majority must abide.

Scientific instruction, backed by experiment, should be given in agriculture. Therefore I would recommend the passage of a law allowing any district, wherein a majority of its voters desired, the privilege of purchasing, beside the school site, enough ground, not to exceed two acres, but ample enough for a large garden with walks and flower-beds, to be used as an agricultural experiment station, and to be under the control of the State Board of Agriculture. Upon this a neat cottage should be erected, in which the teacher of the district should live; this should be the teacher's permanent home. A small rent for this might be charged, or allowance made in reduction of salary for the house being furnished. The teacher should permanently reside at the school-house, and the property should be under his care.

The garden should be laid out per specifications furnished by the Agricultural department, and the seed also furnished should be planted as indicated. The tending of the garden should be under the teacher's control, he to be allowed out of the products reasonable wages for his time. One hour each day during the summer season the shcool should be required to spend in the garden. The names of plants, the varieties of flowers, should be studied and illustrated by their growth. Competition could be used to good purpose by allowing each pupil who excels, a flower-bed of his own to cultivate.

Every experiment directed by the Agricultural department should be illustrated to the school, and the teacher required to make a careful report of success and results of same. The board should furnish the teachers all necessary instruments to carry out their experiments;

composition of the soil should be studied from an analytic standpoint, and the facts learned in the text-book on Agricultural chemistry illustrated; injurious insects studied and the means of preventing their ravages, as indicated in the study of entomology, put into operation. The various ingredients of fertilization should be studied; the substances that form the organic matter of plants explained. The amyloids or compounds of carbon, hydrogen and oxygen, as found in cellulose, starch and sugars, should be distinguished from the other compounds of carbon, hydrogen and oxygen, which form the hard pulp of root, fibers and fruit. Likewise the fats, the organic acids, the albuminoids, phosphates and various other elements which enter into the plant should be studied. The pupils should be taught what soils are supplied with all or parts of these elements and what are deficient. They should also learn what fertilization agencies will supply these deficiencies.

The teacher's home, though not costly, should be neatly and artistically built, and the State Board of Agriculture should be required to furnish the teacher plans by which he can instruct his pupils in the principles of modern architecture, and the best methods of constructing a neat, convenient, healthy country home. In the same manner the construction of barns, paying always due respect to expense and utility, should be taught. The best and cheapest materials for building and the most convenient implements of husbandry and farm machinery should be illustrated.

The same methods, plans, instructions and outlines used on the State Agricultural college farm should be used so far as possible in every district. The teacher should be required to keep the school-yard beautifully adorned with flower-beds—and such being his home, he would feel a personal interest in doing so—to teach the names of the flowers and their botanical classifications, and, if he possesses any art, his school will in a short time be a little band of naturalists, each one of whom can in a moment open the great book of nature, and from the simplest bud that blooms read a story as charming as the shy tints of the blue-bell or as pathetic as the love-lorn legend of Hyacinthus. Botany studied in this way will be remembered. A teacher might for months describe the common golden-rod, and it is doubtful if one of his pupils would recognize it at sight. But let him take his pupils to the garden or fields, and without any explanation point out the flower, and the pupils will never forget it. The pupils, knowing plants, and learning their cultivation as an art deserving the attention of the scholar, occupying the assiduous care of the teacher, will love them, and the æsthetic part of their nature thus developed will materialize in blossoms of beauty around their old home.

They will see that the culture of plants is a study more instructive and interesting than algebra, and many pupils whose minds are too practical to be warped into bookish codes will in such study find their true element. They will be interested in plant growth, and not only cultivate them from a financial but also from an æsthetic view as a means of culture. They will love to plant a tree by the old home and school-house to be remembered by. They will esteem it a fitting monument, more delicately wrought in its wreathed foliage than the sculptor's lines on marble, and feel that Spenser was a true poet when he praised much

"The trees so straight and hy,
The sayling pine; the cedar proud and tall;
The vine propp elm; the poplar never dry;
The builder oak, sole king of forests all;
The aspen good for staves; the cypress funerall,
The laurell, weed of mightie conquerours
And poets sage; the firre that weeppeth still;
The willow, worne of forlorne paramours;
The eugh obedient to the bender's will;
The birch for shaftes; the sallow for the will;
The muirbee sweet-bleeding in the bitter wound;
The war-like beech, the ash for nothing ill;
The beautiful olive and the plotane round
The corner holme; the maple seldom inward sound."

I have thus submitted these few suggestions, and know full well that a thousand objections might be made against them. Yet I believe they are in every sense reasonable. The question of expense would be the greatest objection, but the entire furnishing, including teacher's house, would not exceed at a liberal estimate $1,000. The average district of the State is worth over $50,000, and on such a valuation the item of expense would not be oppressive. Many current expenses now incurred by the district in unnecessary repairs would be avoided, the school premises being a teacher's home, and it being his duty to take care of the property.

But the advantages of such a system of instruction would be manifold. The profession of teaching would then be a calling worthy of the best talent. Only well-educated, practical men and women could enter it. And promising a home and constant employment would induce the best talent to prepare for teaching. Our teachers would then be a class in every respect leaders. Old age would honor its ranks—not as now a set of boys and girls in the business merely as a makeshift till fortune or marriage leads them elsewhere.

Agriculture being required in the schools, our teachers would in a short while prepare themselves in that respect. Agricultural colleges would spring up in every county or congressional district, where there now is but one in the whole State, and that begging for students. Unless there is a demand in the schools for teachers trained in scientific agriculture, the State might as well withhold its appropriation, for students will not pursue these studies. Agriculture carefully taught in all the schools will make the farmers of the State the thriftiest class of people known. Farming would develop into a grand profession, which a scholar would take pride in pursuing. It would increase the wealth of the State. It would add an æsthetic charm to country life, and make the country home a paradise. It would be educating our boys and girls for their homes instead of away from them. The boys and girls leaving school would be worth more as citizens to the State. It would exalt and magnify labor, the true principle of civilization and progress. It would educate the masses of the people for the vocation in life which they must necessarily follow, and would thus be carrying out the true definition of a school given by Pestalozzi: "A school should really stand in the closest connection with the life of the home, instead of as now in strong contradiction to it."

The teaching of practical agriculture in every district school in the land, dictated by common sense, is also fast becoming an absolute necessity. The virgin soil which has for years responded to the efforts of the husbandman with luxuriant crops, is in some places beginning to lose fertility. Nature, unaided by science, will not meet the demands made upon her, and at present the demands are on the rise. Population is filling up—during the last century has increased from 3,000,000 to 65,000,000. If such a ratio continues during the next century, what may we expect? Over 1,000,000,000. The thought is appalling. The Visigoths of Alaric and the Huns of Attila, who poured down from their northern homes and overwhelmed Rome, were nothing compared with this.

But these are not coming armed with brand, sword and fire to plunder, rob and destroy. They are coming welcomed by life's gladdest smile, by the firesides, into the homes of our people.

Think what a mighty problem stands before us! Think what poverty and suffering await the unborn generations if we are not far-seeing and prepare for their coming!

Think to what a high state of culture we must bring our fields to furnish food for such a dense population!

Hence, in behalf of humanity, as well as sound reason and common sense, I am in favor of the science of agriculture being a compulsory study in our country schools.

AGRICULTURE IN THE PUBLIC SCHOOLS.

[An address by Rev. W. P. ARMSTRONG, Clinton, Mo., before the State Board of Agriculture at the Farmers' Institute held at Clinton, Mo.]

This subject has been scarcely noticed in the State of Missouri. Other states have considered the matter to some extent, but practically no results in the right direction have followed. In this address I avail myself of all the material within reach to develop the subject in hand.

We can perform best that which we best understand. Knowledge and skill should be united in the same person. It is as important that the farmer understand the philosophy of the various processes on the farm, as it is that the mathematician be familiar with the principles from which have been deduced his theorisms and formularies. In either case, ignorance produces only routine not likely to be followed by eminent results. I agree that much has been already done for the education of the whole people. Popular education is indeed the distinguishing achievement of modern civilization. In it are the patriot's trust for the permanency of free institutions and the philanthropist's hope for the well-being of the race.

Of all the inventions of the ages, that of universal education is the grandest in its conception, and promises the most varied and beneficial results. It marks at once the era of free government, the moral development and physical well-being of humanity.

But in nations as well as individuals, there is always a better beyond—a higher and still higher for the achievements of the future. In my opinion, the next great educational step is to be an industrial one.

The public schools, in addition to the general training which they furnish, must also educate specially with reference to the future vocation of the student.

All capital is the product of labor, and society itself rests on the broad shoulders of laboring men and women. I shall feel, therefore, that all efforts to increase the edcational opportunities of the industrial classes are a work in the right direction, and that in advocating the introduction of agriculture as a study into the public schools, I am standing on firm ground, sustained alike by reason and experience. But the policy of the movement is not generally admitted, and it will succeed, if at all, over the active exertions of some and the silent protests of many others.

The first thing a novel movement or enterprise meets is always an objection. Perhaps in the argument it will be proper to consider the objections, and after having removed the obstacles, a forward movement may be less difficult.

It is objected that the design of education is mental and moral growth, and that as the mind is superior to matter, and knowledge better than riches, that system of education should be adopted and that course of study pursued which will fill the mind with the greatest number of useful ideas, and produce the greatest mental and moral development. This objection comes from the educators of youth themselves, and is in truth the only one worth a moment's consideration. But although it comes under the guise of an objection, and is intended as a strong one, I accept every word of it as truth and regard it as powerful argument in favor of the industrial sciences in the public school.

Doubtless, if we could penetrate the designs of Providence, we should find that labors and duties are intended as disciplinarians to prepare for the labors and duties of that higher and better state for which this is probationary; and it should reasonably follow that the acquisition and application of the requisite knowledge and skill for the performance of these labors and duties form the very best possible mental and moral gymnasia. If it can be shown that the study of the sciences illustrative of the industries is equally as well adapted for mental culture and discipline as the study of them in the district, then the value of such course as a disciplinarian is equal to that of the course now adopted in the schools. If it can be shown that such a course is better adapted for mental training, then the argument preponderates in its favor, and in either case the fact that the student is thereby the better fitted for life's duties powerfully reinforces the argument.

The faculties of the mind, like those of the body, become active, vigorous and strong, each by its appropriate exercise. Now, which is the most favorable to mental excitement, the study of a science with or without reference to its practical application? In both cases the same formularies and theorisms must be studied and demonstrated. In both cases the same scientific principles must be exemplified by experiment and by facts in nature. The difference will be that in the study of science with reference to its uses, a greater number of experiments will be made and a greater number of familiar phenomena explained. Another difference will be in the course of study pursued. The agricultural student who has not the time or means to go through the usual course of study will elect from it such branches as will assist in mastering the problems of life. He will leave out from the curriculum all languages but his own, and take in their places chemistry, geology, botany, zoology, etc. It is hardly necessary to say that these sciences, in the amount of mental discipline which their acquisition will produce, in the habit and taste for study and in the subject for future thought and investigation which they supply, are greatly superior to any course of linguistic study.

The value of scholastic education is not to be determined by the amount of mental growth produced during the school years. That school education is the best which lays the best foundation for future growth, enabling the student, at the end of his earthly pilgrimage, to graduate highest in the scale of human development. Agricultural studies are, therefore, valuable in the fact that they appeal to and teach the reasoning faculty during the whole life. The farmer employs practically nearly all the physical sciences, and very wide is the field of research for the educated farmer. Accordingly, we find that this subject has engaged the attention of the most scientific minds. The student in this field will ever hold in grateful remembrance Davy, Liebig, Johnson, Draper, Buell, Mapes, and other colaborers in this science. The result of their labors shows that they have wrought in very fertile fields. It is true that the elementary works, which must be employed for a time at least in the district schools, may not contain a great amount of theoretical science. They will, however, contain much of practical and useful knowledge. It is true also their manifest usefulness will be a great incentive to study, and many a student who would otherwise have been satisfied with the shallowest attainments will be tempted thereby into the wider and deeper fields of science. Teachers in the rural districts will universally attest that one of the obstacles in the way of introducing the more thorough sciences into their schools is the belief, too prevalent, that there is no practical use in them; but the utility of agriculture as a study is so apparent that this objection will not be, or if urged at all, will be readily overcome.

The objection that there are no suitable text-books can be made only by those not familiar with agricultural literature or the progress of agricultural science. Several very valuable works have been written, some of which are especially designed as text-books in schools and colleges, and others that are well suited for such use.

In this connection the works of Johnston are especially to be commended. Besides, in this as in other things, the demand will bring the supply.

Only let the want for such text-books be known, and a thousand pens will contest the privilege of supplying it. Every publishing house will have a new book on agriculture, designed for the use of schools.

Their agents will visit the schools, the agricultural and horticultural societies, and the State Board will be waited on with distinguished consideration.

Another objection sometimes urged is the want of qualified teachers. To this it may be answered, that the teachers of this State are an enterprising and intelligent class of citizens.

Let it be established as a fact that agriculture is to be taught in the public schools, and they will not be slow to add this to the list of certified qualifications to teach. Again it is objected that the pupil does not know what his future location is to be, and that he should, therefore, educate himself without any special reference to any location. This is not true in fact.

Practically, the future calling of the child is very early determined, and whatever theories there may be, whatever teachers may advocate to the contrary, the pupil actually does educate himself with reference to what he supposes will be his future avocation; and even the sturdiest opponent to this movement does not stand to his own theory. If a boy is to be educated for civil engineering, whatever else he may be taught, he is certainly trained in mathematics. If he is to be a theologian, he is certainly taught Greek and Hebrew, and carefully instructed in the opinions of the Fathers. His general education may be more extensive, he may lay a larger foundation than the student of the district school, but the fact remains that whatever amount of general culture the boy receives, he is yet specially educated for his future life work.

The State itself has established a legal department in the State University for the education of those who may wish to practice the law. This then, being the rule, with hardly an admitted exception, that the child should be educated in reference to his life's occupation, is it just that those who cannot attend the higher schools of learning should be deprived of its advantages? In the district schools the pupils receive a limited amount of general instruction, and in my opinion the public interests will be greatly subserved by giving them also the opportunity for special instruction.

It is again urged that agriculture is so extensive a subject that it will be difficult to know what amount of knowledge is necessary to fit one to teach. But is the extent of the science an objection to its study in the schools?

People do not reason so foolishly on other subjects. Who has been able to tell where the science of astronomy, chemistry or mathematics ends? The sciences in general are like their great author, infinite. The profoundest philosopher has not the wisdom, nor even the shallowest pedant the assurance, to prescribe bounds to them; but do we on this account exclude them from the schools? The amount of knowledge necessary to teach agriculture will regulate itself, just as with the other sciences. It is not necessary that one should be a Silliman or a Draper to teach chemistry, or an Irzell, Miller or Agassiz to teach geology. Neither is it necessary that one should be a Liebig in order to teach agricultural science. In the several sciences, as taught in the schools, certain text-books have been prepared. Precisely so will it be with agriculture, and the teacher will be required to pass a reasonably good examination on the subjects therein treated. Observation, investigation and discussion would from year to year add to the teacher's knowledge, and correspondingly elevate the standard of qualification. The knowledge which would have procured a certificate to teach English grammar ten years ago might not enable an applicant to pass muster to-day.

One other, and I will have done with this side of the argument, which perhaps I have pursued too long. This is the vague, foolish objection already made against any innovation. It is said to be impracticable. But why impracticable? If the introduction of agriculture as a study into the public schools will result in undoubted good to the State, far surpassing all the additional costs and inconveniences, this progressive, utilitarian, go-ahead age will demand other evidences of impracticability than that of merely looking wise and ominously shaking the head. Before the single power of utility these flimsy objections will be swept away, and we shall live not only to see agriculture but also the sciences illustrative of all the industries taught in the public schools. In that good time coming labor will be honored, and laboring men and laboring women will take their places in public opinion, as they are in fact, the real aristocracy of the State. There was a time not long ago when book-farming or scientific farming was the standing jest of farmers. It was looked upon as a species of pedantry set up in opposition to experience, and it must be confessed that many were the men with heads chock-full of theories and poetry of the country, whose great promise and great failures gave point to the general joke.

If, indeed, I were compelled to choose between theory without experience and experience without theory, I should unhesitatingly take the latter, confidently expecting routine with habits of industry and strong muscles to win the race. For the farmer needs educated muscle as well as educated brain, and habits of industry as well as habits of thought. No one should be foolish enough to suppose that theory of itself can produce great crops. It is theory applied—a skillful hand guided by a wise head—that must accomplish results.

The science of agriculture—a phrase used for convenience—is not one but many sciences, or such parts of them as relate to and explain the practical operations on the farm. Agriculture, as a business, is by universal consent one of the oldest of human pursuits, and it would be paying a poor compliment to the tillers of the soil to deny that anything more valuable than routine has been deduced from all the experience of ages. The value of agricultural science is recognized by the Congress of the United States establishing an agricultural department, and the donation to each State of a portion of the public land for the purpose of establishing industrial colleges in which agriculture is to occupy a conspicuous place. It is further recognized in the fact that several colleges have established departments of agriculture; but it will be generally and sufficiently recognized only when the common schools of the State admit agricultural students and teach agricultural science as a necessary part of a farmer's education. It is said you may teach this science in the colleges but not in township schools. I cannot think of a proposition more sophistically absurd. Not more than one farmer's son out of a thousand takes a collegiate course of study, and of those who do, the number is very small who return to the farm, so the necessity is upon us that whatever of agricultural science is taught to the great mass of the people must be taught in the common schools. A few wealthy farmers will be able to send their children to colleges; a few young men of great energy will work their way through the collegiate course, but the large majority, unless it can be taught in schools of lower grade, will be compelled to forego the advantages of agricultural instruction entirely. The whole people should be educated in the knowledge and business of practical life. By denying the introduction of agricultural science into the district schools, those will be deprived of it who most need its advantages. The farmer tills his own soil or land. His boys take the place of hired help, and cannot well be spared from home. The district and high schools are their only opportunities, and we should make these opportunities equal to their wants. Even the hired man is capable of doing better service by having an agricultural education. He accumulates means and ultimately himself becomes the owner of land, and in his turn the employer of others. In order that agricultural science be valuable to the people, it must be taught where the people can have access to it.

What mockery to provide the benefits of agricultural instruction, and yet have this instruction given only in institutions which no considerable portion of the people can by any possibility attend. It should be taught in the colleges of course. But let the colleges be in this as in other subjects, places to which students may graduate from the schools of lower grades. But what good will it do if every farmer's child be educated in agricultural science? The question of utility properly stands at the threshold of every enterprise.

What use? In the proper answer to this will depend the final success of this and every other movement. We live in a utilitarian age. We are a utilitarian people. And, in the widest sense of this much-abused word, I confess to the title of utilitarian. Utility is the motive power that gives force to an enterprise and overcomes the inertia of popular indifference.

The first and most manifest benefit arising from agricultural education will be the general increase of the products of the farm. As already stated, the farmer applies practically important principles of science. That in order to apply these correctly it is necessary to understand them, is a proposition which needs no argument. When the farmer plows he changes the mechanical and chemical condition of the soil; when he plants and cultivates he is making a beautiful experiment in organic chemistry; when he feeds his live-stock he is applying principles of physiology and hygiene; and finally every kind of farm work requires, in order that it be done at the right time and in the proper manner, practical knowledge, as well as practical skill. All these should be taught in the school-books, the best methods explained and the reasons for them. The effect will be to form early habits of thought and to cause knowledge and judgment to take the place of routine.

We should expect to find, as is the fact, in those countries where agricultural science is better applied a corresponding increase in the products of the earth. Great crops are not accidents. The laws of nature are uniform. In agriculture, as in other things, the same causes will always produce the same effects. Wherever exist the necessary conditions great crops must be produced. To explain what are these conditions, how, at the least cost, to preserve them when present, or to produce them when absent, is the legitimate work of agricultural instruction. Let us suppose all the valuable knowledge on this subject contained in agricultural books and papers arranged into convenient and systematic form, and published in a series of school-books numbering 1, 2, 3, etc., from easy primary works to those more thoroughly scientific, and that these were made a part of school course for the farmers' boys, what great results might we not reasonably expect? Within the next generation the agriculture of Missouri would take a new form and a hundred per cent be added to the average products of the soil. The ditch, underdrain and subsoil plows would carry from our clay lands the excess of moisture which is now compelled to evaporate into the atmosphere, generating many pestilential fevers; the soil made rich by the judicious application of fertilizers; the houses, barns, orchards and fences take neatness, order and beauty, and our glorious Missouri become the Arcadia of the United States.

In the single fact of under-draining alone, the State will be compensated more than a hundred fold for the cost of teaching agriculture in the public schools. Educational institutions are for the young; the youth should have opportunities to prepare for life's battle, in which they are soon to engage. Let the farmers' sons be thoroughly educated in the principles of scientific agriculture. Let theory and practice go hand in hand, and the year that witnesses the adoption of these measures will mark the era of improvement, and the person of middle age will live to see advantages accruing beyond all calculation. With the improvement of agriculture will come a corresponding improvement in other industries and of society itself.

Endless, indeed, are the collateral advantages which would result, among which the suppression of demagogism and corrupt politicians will not be the least. The general increase of intelligence will make the people so jaunty a nag as to render the riding of them a dangerous experiment. Patriotism is an amiable weakness, and I shall be pardoned for the desire of seeing Missouri take the lead of the States as the Union does among the nations of the earth. The great resulting moral advantages must not be forgotten. It has been beautifully said that the laws of nature are the "elder word of God." The student of agriculture is the student of nature, and whether studying or applying this "elder word," he will feel that he is ever in the presence of the invisible but omnipotent God, to whom study and labor are at once a homage and a prayer.

AGRICULTURE AND EDUCATION.

[Written by Mrs. S. C. POWELL and presented at the Maryville (Mo.) Farmers' Institute.]

Fully cognizant of the significance of the honor conferred upon me to-day by the distinguished representatives of the great agricultural interests of dear old Missouri, I am painfully conscious of the weakness of words.

If, by some inborn native magnetism, I could impress you with the proud and happy emotions that sway my soul, how quickly would the eloquence of a Webster, the earnestness of a Patrick Henry, be eclipsed! But, alas! we have not yet reached an atmosphere of unadulterated thought, therefore I must meet your kind consideration with feeble words that but dimly voice my thanks.

Between what I have learned from political speeches lately and from the pulpit, and from what I have heard on the streets, and above all from the loving and appreciative tributes paid one to another (and to some other people too, for that matter) by the fearless and peerless representatives of the Maryville press, I have been, as the story-writer would say, "torn by conflicting emotions" in my attempts at selecting a suitable subject for this paper.

I always like the new and novel, so at first I thought I would write about "the tariff."

I thought too that I was pretty well posted on that subject, but I have been led within the last few days to look upon "the tariff" as something mysterious and awful, and I hardly dare mention it.

The dictionary says: "Tariff is a list of duties or customs to be paid on goods imported or exported." That's easy enough to understand, but, oh my, if what Noah Webster didn't know about the tariff of to-day was printed, it would make a bigger book than the "Unabridged."

I have found out that there is an old tariff and a new tariff, a common tariff and a proper tariff, a former tariff, a medium tariff and a latter tariff, a high tariff and a low tariff; and now here comes Bill McKinley, or McKinley Bill, or whatever his name is (you all know whom I mean), with a regular "what is it" of a tariff.

Some people are calling for "a tariff forever new only." Just as though anything would stay new forever.

Then some people seem to be without shelter—haven't even a dug-out or an umbrella, and they cry for tariff to come and protect 'em. A nice-looking old gentleman, who spoke here the other day, said that there was a tariff on almost everything—lumber and hardware, and hats and socks and shirts and dresses—and so I feel confused and worried. When I meet people, I wonder how many tariffs they have, and what kinds of tariffs they have, and if they are crying for any they haven't got.

When I take up my cup and go to drink my coffee, I hesitate and feel sorry, and wonder if it hurts the tariff any to be swallowed.

So I have concluded that I wouldn't even mention "the tariff" in this paper, but would keep on safer ground, and write about agriculture and education. They're not so complicated.

The infancy of agriculture, shrouded in the blackness of an unlettered era, matters little to the mighty, pushing tide of the nineteenth century.

The first seed sowing on the slowly receding floods of the Nile, with no implement but the human hand and arm, holds little interest for us. The imagination has scarcely time to picture to our minds the original plow and the primitive yoke.

We take no note of the steady onward march of this mother of civilization adown the dim deserted aisles of the past.

In regard to her early literary devotees, Fitzherbert, Stephens, Jethro, Hull, etc., we have, at best, but a slight curiosity; while our disapproval of Lord Bacon's merciless and uncalled-for gathering up of all the agricultural works of his day and consigning them to the flames, is more positive than superlative.

The effects of the Roman conquest upon the history of this momentous force, its well-nigh fatal decline with the Saxon invasion, its almost miraculous preservation through the dark ages by Christian zeal and knowledge, our philosophy pauses not long to consider.

Although fertilization, under-draining, irrigation, sub-soiling, etc., have succeeded in the accomplishment of that which seemed utterly impossible, the world does not wonder.

Yesterday, and the things thereof, have gone from us forever.

The present only is ours, and in the broad light of the To-day, a grand spectacle is revealed to us.

We behold Agriculture the leading hand in a huge corporation of mighty powers.. She has gone into partnership with steam and heat and electricity.

She has invoked the sciences, and they have hastened to her aid; and now she reaches out, not with her own strength alone, but as with and quickened by the most gigantic forces of nature.

The devotee of liberty, she rules empires; she controls markets; she regulates commerce; she inaugurates great industries; she exalts labor, she confuses capital.

She demands governmental control of railroads, telegraph and telephone lines.

She demands a strictly secret ballot system, a graduated income tax, a law that will secure a flexible volume of money commensurate with the needs of the people, the abolition of national banks, the free and unlimited coinage of silver, uniform text-books for our public schools, at cost.

In fact she is the central figure of our national greatness, and by some occult influence, pervades the atmosphere of every home.

And all the world wonders!
"Nothing succeeds like success."

Time was, when to be a tiller of the soil was considered an abasement.

But since that time how things have changed! Why, I have heard that certain candidates for political honors, who live only a thousand miles from Nodaway county, and who don't know an elm tree from a hazel-bush, nor a Poland-China pig from a Plymouth Rock chicken, go about the country picturing to the farmers their genealogical trees gracefully waving o'er the walks of history, every branch decorated with a scythe and hoe, every leaf sprinkled with hay-seed, an air motor whizzing above and a steam thresher whistling beneath.

Verily the world moves.

Lying at the base of the agricultural interests of this State are her district schools.

Referring to the Twenty-second Annual Report of the State Board of Agriculture, I note that three-fourths of the school children of the State are attending the country schools. Thus the farmers unite in declaring education to be the great cultivator. But what is education?

The problem known as "the squaring of the circle" has harassed the minds of students and scientists for 2,500 years, and now that geometers have succeeded not in solving but in demonstrating that the problem cannot be solved with ruler and compasses, the mind of the pupil is sent back to a period 500 years before the Exodus of the Israelites to study the history of this primeval puzzle.

Again, the adventures of Romulus, the feats of Hercules, the fables of Horsa and Hengist, the effect of the Crusades, the rise and fall of old empires, etc., ofttimes take up the precious school days, while the great debate on "Jones' barn versus Jones's barn" waxes loud, and the "Amo-amas-amat" of a tongue long since gone to dust holds its own against the German, French, Spanish and all other live foreign languages.

Does all this tend to make our boys and girls a part of the living present? Is this education? In my humble opinion, the "science of numbers," the "art of speech," the study of dead languages, and many other things, have too much time given to them in our public schools. The demand of the hour is for wide-awake, keen-eyed, strong, practical men and women.

We want no dreamers. We shun the mere theorist. The wheels of progress have grown too wide for the old ruts, and have begun their revolutions on the golden tracks of common sense and common need. In their rumblings we note the call for diligent and earnest study, not only in that which will add to the wealth of man, but in that which will conduce to his physical strength, mental equipoise and spiritual growth.

Now, nothing is more imperatively demanded by the needs of Missouri, than that her children should become possessed of a fair knowledge of the natural sciences.

Let astronomy awaken our boys and girls to the countless, fathomless mysteries of the heavens above them, "each star an alphabet," while "meteors, rainbows, auroras, shifting groups of stars, make pictures vast and significant as the armies, angels and falling stars in the revelation of St. John."

Let botany teach them to truly "consider the lilies," and lead them to a nearer consideration of all plant life, the study of forestry, its climatic influence, etc. This study opens up mines of wonder to the child. By illustration and apparatus, let physics enable them to read nature through the language of experiment, and to become cognizant of the characteristics of those forces which make sure the harmony of the spheres.

Chemistry places the child in the very laboratory of nature.

Then what a grand study is geology. A little well-directed attention to the formation of the ball we live on cannot fail to add to his temporal comfort, while through his investigations of the phenomena on every hand, the pupil unconsciously arrives at an understanding of divine benevolence, which can but minister to his spiritual welfare.

The study of zoology adds a new interest and gives a new dignity to every animal on the farm, from the pet lamb to the prancing thoroughbred.

And last, but greatest, comes physiology, constituting the corner-stone of self-knowledge, and in connection with hygiene, forming the ground-work of physical strength and beauty.

A popular educational monthly strikes the key-note in declaring that

> Never before in the history of the world has the mind reached out so far beyond what the eye can see. It matters not whether it measures and studies the atoms far below the possibility of sight or the unseen universe lying beyond the penetration of the most powerful telescope: the mind of the modern scholar is continually reaching out far beyond the present limits of knowledge.
>
> This activity, stimulated by research and investigation, cannot fail of being useful in the highest degree to the mental powers. Instead of plodding over the intricacies and contradictions of human speech, the mind is brought into direct relation with the speech of the Creator. Instead of trying to harmonize discordant opinions of man, it is called upon to classify and record the magnificent thoughts of God. It matters not whether the attention is turned to the animal, vegetable or starry world, the same stimulus is afforded, and the same beneficial result is reached. Why should not the natural sciences claim a large share of the attention in all grades of our schools? They are not of the dead past, fossilized in the language of a dead race, but they belong emphatically to the living present, and in them is a prophecy of still greater achievement in the near future.

My friends, I submit this paper with the sincere conviction that the more intimate our children become with "The Circle of the Sciences," the more able will be their citizenship, and the more rapid will be the development of Missouri's many valuable resources.

EDUCATION AS IT BENEFITS THE FARMER.

[Written and read by Prof. CLARK, Principal of the Tipton (Mo.) school, at the Farmers' Institute held at Tipton.]

At this present time the languished condition of our country districts and the inefficiency of our country schools are subjects of grave concern to those who have at heart the best interests of our nation. There is a kind of restlessness which betokens dissatisfaction among our farmers—an uneasiness that seems to be brought about by the idea of unjust discrimination against the class. Why is it that so many of our people leave their farms and flock to the cities? Very largely to secure better schools and social advantages.

The highest interests of the race demand that this city movement should be reversed.

The wise statesman and the far-seeing educator of the twentieth century will devote their best efforts to promoting the prosperity and elevation of the rural districts. We remember with what enthusiasm the farmers hailed the Grange movement as a probable means of relief from burdens they thought they should not bear; and now the Farmers' Alliance numbers its members by the thousands.

We doubt not that the farmers have reaped untold benefits from both these institutions; but we fear that, in their zeal for legislative aid, they have lost sight of the thing of which they are most in need. It may be, as many think, that there are possible legislative reforms, which would relieve the stagnation in business of which our farmers complain; but we think that the cure for the ills to which they are heir must come along the line of an increased intelligence and broader conceptions of the problems of human living.

No religious craze was ever put down by physical force, for the supposed martyrdom of its heroes only tends to increase the number of its devotees. But let the pure light of an enlightened conscience shine upon it, and it melts like the mists before the noonday sun.

Instead of recognizing this principle of intellectual growth, the French revolution crowded the experience of a century into a few brief months and deluged France with blood. So it was an intellectual sun whose rays pierced the thick clouds of the dark ages of Europe and formed the roseal hue of the Reformation. And when the star of learning went down in the Old World it arose on the New, and kindled here in America a flame whose rays are for the enlightenment of the nations.

I am not here to advocate that every boy should be taken from his farm and compelled to spend five years mastering Latin and Greek in college, but rather that we should make our country schools so good and the social conditions in the country so favorable that many of our best people will prefer the country home to the city residence; that in the country the boy and girl may get sufficient training to fit them for their life-work; to enable them to decide intelligently upon the problems which daily come before them; to have the faculties of their minds so broadened and quickened by contact with others that they may be enabled to think and reason upon any subject. Nor do I think that professional training alone will accomplish this result, for strictly professional training is likely to make the man a machine; to develop the farmer instead of the man on the farm; to make the priest a farm, and the attorney a statute book.

When our laboring classes come to realize the fact that their hope of relief lies along the line of an increased culture, when they come to turn the surplus energy which they now expend in howling for the legislature to do something into inculcating lessons of industry and sobriety into the minds of their boys and girls, then they will have reached a solution to the problem which now perplexes them.

When they come to realize the fact that their failure to compete successfully with other lines of business lies principally in the superior judgment and shrewdness of their competitors, and to take steps to remedy their defects, then will come about that happy equilibrium of industries which tends to the good of all. There is no such thing as failure for the man, or set of men, of average physical and mental force, into whose character there has been branded frugality, temperance and industry. I take it that education is character-building; and the character which does not have these elements built into it has not been built aright, I care not whether it has been formed under home influences or in our schools.

Let the man who has failed to make a success of life seriously consider in whom the fault lies before he blames any one but himself for his failure; and if he is honest with himself, he must in most cases conclude that it was from his lack of ability to judge aright the various forces with which he had to do.

We repeat, that our laboring men must eradicate from their minds the idea that the only thing for them to do is to lie supine and wait for something that may never come. Progress is the ideal of the age, and every one must by his own exertions push himself to the front, or be shoved aside by his more progressive brother, and stand with arms akimbo watching positions for which he had longed be filled by others with more energy and determination.

It is not strange that our farmer, living in the quiet of his rural house, far removed from the bustle and hurry of the centers of our great American civilization, should have fallen a little behind in the steady march we have been making onward, and I trust upward.

Nor is it strange that he should under-estimate the value of intellectual culture as a means for the betterment of his condition. It may be that there is something radically wrong with our government, which causes it to dispense lavish favors to the lazy few and bind the millions of honest toilers with chains of poverty and want. It may be that there is some foundation for this cry of inequality, and the desire for the equal distribution of all wealth; but it seems to us that it is only selfishness, which has overcome the instincts of the nobler self, and demanded wealth produced by the sweat of others' brows.

The only opiate that can quiet the great nerve of our laboring classes, which in some places is twitching from disease, is that furnished by an increased intelligence.

We must in some way illuminate the bottom of society, and bring it to see the true principles of success. He who can the best accomplish this will be a philanthropist indeed.

It is true that the people of our land, as a class, are the best educated people in the world; but their responsibilities are also greater.

In a country where the will of some one individual is the sovereign power, it matters little to the government whether the people are intelligent and refined, or ignorant and brutal; but in a country like ours, where the sovereign power is vested in the people, it matters much.

And when we think of the vast number of illiterate voters within our country, who are daily being increased by accessions from all over the world, we must conclude that the question of the better education of the youth of our land is of more practical moment than either the force, the McKinley or the sub-treasury bill.

Nor must the farming element shift their part of the responsibility of this education. It is a duty they owe to themselves and to their country. And of all the watch-words of life, duty is the highest and best. He who sincerely adopts it lives a true life; he is really the successful one. It pertains to all the parts and relations of life. There is no moment, place or condition where its claims are not imperative.

Where men are assembled in large numbers, they are likely to be carried away by party spirit or popular enthusiasm. But the farmer, in the quiet of his country life, may calmly decide upon the policy it is best to pursue, and thus act as the governor of the mighty machinery of our vast and complicated government. "Every revolution was first a thought in one man's mind, and when the same thought shall occur to another man, it is the key to that era. Every reform was first a private opinion, and when it shall be a private opinion again, it will solve the problem of the age." And if we can trust that our "private opinions" and our "first thoughts" are to originate in the minds of an educated country people, we may be sure we will not go far wrong. It surely would be a source of unalloyed pleasure and profit to a farmer to be able from the force of root and suffix to explain the words of classical origin on any page. And what a delight it must be to him who is able to gather his little family about him in the quiet of a summer's evening and point out to them the constellations and planets, and explain the motions of these in their stupendous flight through space. What aspirations, what thoughts for contemplation must come to those who have penetrated far into the secrets of human wisdom and taken deep draughts at the springs of learning. It fills the life of him who is able to hear with the hallelujahs of the heavenly host, while the duller nature at his side can hear nothing but the din of daily toil, and feel no pleasures higher than those furnished by the duller physical nature.

AGRICULTURAL EDUCATION.

[A paper read by Mr. ALBERT FALCON before the Farmers' Institute in Appleton City, January 10, 1891.]

At no other time in the history of American agriculture has the want of a thorough agricultural education been felt as at the present. In the early days of the settlement of the different sections of our vast domain, the soil was in full possession of the vast accumulations of plant food that had been growing greater in quantity each year by decaying vegetation, and, as the surface was covered with stems and trash that prevented the washing away of soil fertility, plowing and planting done in the most indifferent manner would produce marvelous yields of wheat, corn and oats at a very low cost of production.

But all is now changed, and we are face to face with a different state of affairs—a soil that scarcely yields one-third the amount it formerly produced, and the amount of work done to produce the lesser yield costs fully twice as many heavier days work than formerly, because dead soil works harder than live soil; also longer in getting into condition fit to work in the spring, giving a less number of days to get in crops. But this is only one part of the loss. A dead or impoverished soil is a slow grower of plants, thereby requiring a much longer period to mature a crop, which in case of a drouthy season means a partial or total failure of crops, not only in the past, but in the future years to come. On every hand we hear the cry that farming does not pay, and in some sections lands are being abandoned at the very centers of commerce, and in other sections the farms are passing into other hands under foreclosure of mortgages, and with a prospect of many more to follow.

But some will say this is over-drawn; this one and that one have made a financial success, and what one can do another can do. Such a one made a thousand dollars in some way, either in hogs, cattle, corn, or perhaps a crop of apples—the only one, perhaps, in twenty years—and we only hear of the exceptions, and not the general average of the whole field; and here is one place where agricultural education comes in, so that if one of these marvelous things comes up for a farmer to do in order to make farming pay, the farmer will be able to analyze and apply or appropriate what may be of use to him.

I will proceed to give you a few illustrations of the character of advice we hear every day and on every hand, and by men of whom you would expect better things. One of such advised and was urgent that cattle feeders should abandon the feeding of cattle, as it did not pay, and to go into what? Into the banking business, in which he was engaged? Oh! no, but into raising chickens for eggs, as it was now "a big thing." Now, at the very time this advice was being given, eggs were selling at 5 cents per dozen, and roosters at $1.50 per dozen, or 12½ cents a piece. But this is not all: he also asked me why it was that a certain class of our citizens went into debt and paid off their indebtedness and were prosperous, while the plagued Americans went and spent their time at politics and lost all. And without waiting for a reply he replied for himself, and among the whole outfit he enumerated one German who had failed, and the reason he failed was because he went to church on Sundays and sent his children to school on week days. One other advised to "feed hogs milk and corn meal mixed with potatoes well cooked;" and so I might go on for hours and not exhaust the advice given to make farming pay. I hope that from the facts I have cited you will see that it is very needful that we look well at the advice given and find out if it is practical. Is there a profit in so doing? is my farm suitable and are my habits and modes such that I can comprehend the littles and control them to make a profit? for it is attention to the small details that usually turns the balance to a profit, for if it costs us more to produce a pound of beef or pork, or a bushel of wheat or corn, than we realize in market, we are losers by the operation. We are constantly being told that this or that is the right way, or right thing to make, or grow on the farm; they, however, fail to tell us how much it costs and how much profit, unless they think we have a cool $1,000 and want us to invest it in a cheese factory or creamery; and by the time we get nicely into business and want our share of the profits, why there has been an over-production and we have done business at a loss, our $1,000 has gone glimmering, and one more person has received some agricultural education.

Speaking of agricultural education reminds me that our State Board of Agriculture is represented here to-day, also officers of the U. S. experiment station, and I sincerely hope that none have come hoping by a few minutes of listening that you can go home and grow rich in a hap-hazard way of farming; they at best can only give general outlines in so brief a time. It is for you to dissect and draw out conclusions and apply them to your immediate surroundings and conditions of soil. There is one thing they will all agree on, if you observe closely, and that is that you have a thorough comprehension of the work you are about to do, be it making cheese, butter, beef or pork, or growing corn or oats—not only doing it thoroughly and well, but, above all, doing it in time, noting well the new facts of value as they present themselves for future use.

Some no doubt will say, if we could do as advised by those speakers, we would raise so many bushels of corn and oats there would be such an over-production that it would not be worth hauling to town. Oh! you over-production fiend! Are you alive and still here to torment decent people? I met your brother last year and he had the same cry, and I advised him to go home and raise a big crop, and that by the time it was grown it would be profitable, even if he raised 100 bushels of corn or oats to the acre; and time has proven me right. It is the runt crop of corn, wheat or oats that is grown at a loss; the runt pig or calf is a dead loss several times over. We must strive to produce not only the very best, but at much less cost than ever before, and that can only be done by a more comprehensive understanding of the science pertaining to agriculture. By a more complete understanding of the science of agriculture we are enabled to not only grow larger crops each year, but at lessened cost per pound; also to breed a better class of farm animals; and having grown cheaper animal food of a more varied variety, we are enabled to feed the same in a more judicious and saving manner. And having more knowledge of the various needs of farm animals, we are able to keep horses, cattle or hogs in better growing condition, which means less loss by disease, and that helps farm profits.

But to get back to my text: Soil fertility, and its preservation by a more general and thorough agricultural education, is the only sure way to make the farm pay; and as it is impossible for all to secure the requisite amount of soil fertility and cover our vast fields at a cost within our reach, rotation of crops furnish one of the quickest methods of retaining fertility and raising a crop that pays, and that opens a vast field for discussion whereby the masses are to be benefited. How the mass of our farming community are to receive the most practical knowledge of an agricultural education is a very deep and grave question—one that I dare not attempt to answer in full, but hope that ere long some way may be devised whereby all, and not the few, will at least be enabled to make the farm pay. We are a great nation, but cannot long remain so unless we can prevent our farm owners becoming serfs or tenants. Our greatness has come from the masses owning their homes and farms. Destroy the owning of farms by the tiller of the soil and replace them by tenant farmers, and you sound the death knell of American liberty and American greatness. To prevent both, give us a more thorough agricultural education of the farmer, so that he will be enabled to make the farm pay, and you will have the most happy and prosperous nation on the face of the earth.

THE FARMERS' NEED OF EDUCATION.

[An address by President McCune, of Avalon College, Avalon, Livingston county, Mo., before the Farmers' Institute held at Tina, Mo.]

There is no class of citizens in this nation that ranks higher in morality, in usefulness or patriotism than the farming class. From no class have more eminent merchants, distinguished professional men, great educators or patriotic statesmen sprung, in proportion to their number. As a class they are not inclined to embrace fallacious and dishonest principles in political economy.

Of the Henry Georges and the Edward Bellamys who devise schemes whereby to take land and other property from men who have honestly earned it and know how to take care of it, and give it to men who never earned and would quickly squander it, not one in a hundred of them ever owned a farm in their lives or ever did an honest month's work on a farm.

Farmers, as a class, are not usually duped by such dishonest and chimerical theories.

But for many reasons it is of advantage for farmers' boys who mean to be farmers to obtain a good education.

What is a good education?

A good, valuable education has two very important elements: First, knowledge; secondly, the development of the capabilities of the mind itself. Now as to knowledge, the things that the human mind can know are absolutely beyond all limit. The number of things that a man may know in this one world we call earth, far transcends the length of time that any man has in which to learn in this transient life.

Then the number of worlds in God's universe is practically limitless, for those within the range of our telescopes run away up into the millions, when we count the suns and their visible and invisible but supposable planets. And the more powerful we make our telescopes, the more we increase the visible number of suns and planets and satellities. And supposing that in the cycles of eternity we should at last master all that is to be known, minute and vast in all creation, there would still remain to be known all that belongs to the infinite attributes of the eternal God, and which never could be fully and exhaustively grasped and understood by any finite mind.

But there are certain things which we may learn to know in this world, and educators and the patrons of education have reached a sort of agreement about a course of study which will not take too many of the years of the short life, and which will yet be of very great value to the student in after life, and if rightly used, possibly to all eternity.

The course of study may include a knowledge of the material world—of the earth, of its continents and islands, mountains and valleys, its lakes and rivers; of the strata of the earth and its fossils, taking us far back beyond the Adamic era in the study of animated nature. It may include a knowledge of every animal that lives on its surface, and of every bird that flies and of every fish that swims.

A good education involves a knowledge of man, who stands at the head of all created things on earth, and has rightful dominion over them all. It includes a knowledge of his body with its wonderful and exquisite mechanism, and its marvelous uses and adaptations, and of his soul with all its faculties, which was made in the image of the great God, and of all the relations in which man stands to his fellow-man, and all the duties he owes them, and all the duties he owes his great and beneficent Creator.

It includes a history of man in the ages of the past, and that necessarily includes inspired as well as uninspired history, as uninspired history stops short many hundred years this side of man's creation. But this mere acquisition of knowledge, however wide it may be, is not all of a good education, nor perhaps the most important part.

The mind may be crammed with the facts and statements of text-books by a mere effort of memory, with very little independent thinking and with a very limited knowledge of the reason why, concerning facts and truths and principle. An indispensable part of a valuable education is the learning how to think aright. It is: The strengthening of the powers and capabilities of the mind itself.

This part of an education gives the mind power to control itself, to direct its faculties to one subject for that length of time that may be necessary to investigate and understand that subject—the power to reason successfully from premise to conclusion, to look fairly and impartially at both sides of a question, and to look all around a subject and take in all material details.

This trend of capability enables a man to make a wise use of the knowledge he possesses. It gives intelligence to common sense and reliability to judgment. Some teachers have great skill in pouring into their pupils' minds the contents of a text-book, but very little skill in drawing out the results of their pupils' own thinking. But of what advantage would a symmetrical education be to a farmer's boy who aims to be a farmer—an education that consists of a good store of knowledge on the one hand and a thorough mental training on the other—who needs to understand so many diverse things and to exercise a sound, discriminating judgment about many things more than he does? He needs to be able to understand the various kinds of soil of which his farm is composed, to know which is best adapted to corn and what to wheat, to oats, to timothy, to clover, to orchard and to pasture. He needs knowledge, but he especially needs a nice discriminating judgment. He needs to understand all there is to be known about the rotation of crops. He needs information as to the nature of fertilizers and their adaptation to the various crops. He very much needs to have the trained eye and nice discrimination that make a man a good, reliable judge of live-stock, of cattle, horses, mules, swine, sheep, and even of chickens and ducks and geese.

He ought to be an intelligent, cultivated man, that he may exert the right kind of influence in his school district, his neighborhood and his church. He should be a well-informed, refined gentleman in order that he may be a suitable companion for his well-educated wife. The time has come when many young farmers do indeed want their wives to be good cooks and good housekeepers, but they also want them to be intelligent, cultivated ladies.

The farmer should have a competent knowledge of architecture, that he may construct an elegant and commodious dwelling and a suitable barn and convenient out-houses. And he needs a refined taste that he may ornament his grounds, and thus constantly minister to the sense of the beautiful in his wife and children and friends, and make his home attractive and his family contented.

The farming class need a good stock of useful knowledge and a well-trained mind to keep them from becoming the dupes of demagogues. It is not maintained, it is not believed, thatfarmers are more liable to be duped than other classes.

But farmers are the ballast of the ship of state. And if they go wrong and stay wrong, we shall have natural shipwreck. We cannot afford to have the farmers go seriously wrong in matters of state in the country.

Some farmers at times have been duped by demagogues as well as men of other classes. Some of them have embraced, for a short time at least, financial theories that the great financiers of every civilized nation belive to be utterly baseless and impractical. Some of them have temporarily toyed with the schemes for the lending of money to farmers by the government that are not only impracticable, but which would in practice be palpably unjust to all other classes of citizens in the nation, giving advantages to farmers which could not be given to all classes.

Farmers should have a wide knowledge of facts concerning the finances of the nation, and they should have a competent knowledge of political economy, so that ambitious candidates for office when they come around seeking for votes cannot deceive them with schemes, however plausible, which at bottom are both crazy and dishonest. Farmers should have such education and such capabilities that we could nominate and elect and send as many farmers as lawyers to the State legislature and to Congress. There are certainly many more of them, and we are not very scarce of lawyers either. Farmers should be such capable men and so skilled in law-making that they could batter down and crush the breath out of all those dishonest trusts and combines which constitute the newest and most cunning form of selfish dishonesty.

And farmers should have such a moral education—such a thorough understanding of and obedience to the eight commandments and the golden rule, the royal law—that whilst they are opposing the trusts and combines of other classes they would be utterly incapable of turning around and they themselves forming a selfish monopolistic trust or combine.

THE FARMER AND INDUSTRIAL EDUCATION.

WILLIAM MUIR, Fox Creek, Mo.

Among the elements that go to make up the farmers' movement of to-day, no single one has a more marked, distinctive or encouraging feature than their earnest desire for information, for education. The blind leading the blind will soon be among the lost arts. Along with this comes another feature, that of economy in all the expenditures, whether it be in mere force or in money, the result of that expenditure of force.

They appreciate the fact that our State has made very liberal endowments in behalf of education, and they are ready to examine all the facts in the case so as to be in a position to decide if actual results are achieved in return for the expenditure of time and money in that direction. This examination has raised not a few doubts, and made apparent some weaknesses in our public school system.

There are some mistaken ideas as to what constitutes education. Is it a mere training of the memory, a reference to past forms and conditions, or is it to become acquainted with our actual surroundings and be prepared to take our part in the actualities of life? To enduce or bring out the powers of the individual to the greatest perfection, or merely to play a fictitious, often a meaningless part, in the great drama of life?

This is pre-eminently an age of expositions, of "exhibitions." Take the average "last day" or recess "exhibitions" in our schools, and judge of the system by them. What can we think of our educational system by these exhibitions of the results of the terms of study, or illustrations of the methods and matter that occupy them?

Institute similar inquires through the entire range of the system in vogue, if system it can be called, and there is but little to cheer. Indeed, it will take but little thought to demonstrate that the most that is acquired at our public schools is a bungling acquaintance with the tools, the instrumentalities by which an education can be acquired from the actualities of life.

Then again, there are but few teachers who start out with the purpose of making teaching a life work, but use it only as a step toward obtaining a living in some other occupation or profession, and are working on such lines as will prepare them to follow that. Neither the proper interest can be taken in teaching, nor the best methods be expected to be searched out under such circumstances.

Then comes the fact that the value of the true teacher is not recognized, nor is provision made for his proper recompense, and consequently there is no inducement to make it a life-work, and to produce the best results. An examination of the rates paid teachers in the several school districts, as given in some of the reports of the State Superintendent, presents this fact in a most striking light. We have a case in point in which two young men started out in life, one as a teacher, the other as an ox-driver. The teacher was paid $35 a month and boarded himself, the ox-driver had $39 a month and his board.

Again, there is too much latitude in the selection of text-books and in the course of study. Too much is left to the teacher on the one hand, and to the school directors on the other. With so many inducements to the change of teacher, it is almost a total impossibility for the new teacher to tread exactly in the footsteps of his predecessor and consequent loss, confusion and irritation in the school; and where the changes are frequent, as is the rule, the loss to the child is of the most serious and discouraging character.

Again, the dominating idea in our educational system seems to be that of its leading in a professional or classical direction. The theory of our educational system has undergone a notable change since the establishment of our Government—one that has not been properly appreciated or thoroughly understand. The early and fundamental idea of public education was to prepare citizens to become acquainted with the laws of the land, understand and obey them. The Morrill bills of '62 and '67 went a grand step further in making provision for a distinctively industrial education as being essential to the requirements of the times and the wants of the individual. It is a proper subject for inquiry, how far this idea has progressed, or has dominated our methods during the past twenty-five years? What practical methods have been introduced to our system to carry out the industrial feature? Where is it to be found in our school books or school apparatus, in the methods of the teacher, in the training of the teacher in the Normal schools? Echo answers, where? But it is found in our Agricultural college, say some. That has been erected to secure the grant, and to be over-shadowed and dominated, to use no stronger term, to give scope and effect to the classical idea. As a consequence we have the walls of our Agricultural college, but its soul, its vivifying element, the young, rising industrialists of our State, are wanting, as is clearly shown by the number of students and graduates that are on its lists.

It is about time the people were instituting an exhaustive inquiry into what has become of the funds sacredly set apart for industiral education, what results can be seen for the investment and expenditures, and they have begun to do it.

Opinions may differ in regard as to who are the true friends of our Agricultural College and of true industrial education; but it may well be the subject for serious thought, whether the money being expended on our State educational system is producing the best results, and whether our Agricultural College is practically related to our educational system, or existing on a plane so much above and so remote from the mass of the people originally intended to be benefited by it, that it is of little practical benefit to them.

Our common school education has been conducted on too empirical principles. The people and the directors have paid too little attention to the actualities that constitute education. Their whole duty was discharged by the employing of a teacher under the most economical conditions. Why should they trouble themselves about a subject to the practical details of which, or its results, they had no time to give thought, and they had employed a man to attend to that as they employed the physicians or lawyers to take charge of their bodies and estates, or the commission merchant to attend to the sale of the crops. Their responsibility had ceased; but it is pertinent to ask, who bore the loss?

The teacher, on the other hand, took a purely business view of the matter. He was employed to teach so many children, so many hours of so many days, at so much salary, and give a fine exhibition of memory and mimicry at the end of the session. He had but little to hope for in the way of permanency of employment; two to five dollars a month on either side was the great consideration. In nine cases out of ten the school was merely used by the teacher as a steppings-tone to the pulpit, the law office, or the physician's diploma.

Here a piece of fine work is got in by the school-book rings and agents. There is a constant effort to divide the opinion of the directors and teachers, causing frequent changes of books, and the teacher gives proof of his success by rushing the pupils through them to the great detriment of the pupils, and cost to the parents, but to the immense gain of school-book firms. In the case of many teachers, all that can be presented to the patrons of the school is the number of books the children have been rushed through and the mimicry exhibitions at the end.

These are the returns the people want, they are the popular criteria of the value of a teacher, and why should they not be given? Humbug is always best paid.

A glance must be taken at the Normal schools, the true manufacturers of the true teachers. We know that many of the professors of these institutions have no sympathy with existing conditions, but are powerless to correct them. They, of necessity, move in the grooves in which their organic laws have placed them, and opposition to or divergence from them would be culpable, as they cannot be superior to the power that created and maintains them, legislative authority. There can be no doubt that these schools will be elevated to a much higher plane of utility, and will be able to hold up nobler aims to the students, by the more appreciative efforts, proper remuneration and life-work in an exalted sphere. They will greatly aid in solving the problem that will give unity, harmony, efficiency and the most practical results to our system of State education.

The State Board of Agriculture and the heads of the Agricultural college are all right on the "industrial education" question. Many of the leading men of these bodies have been "martyrs" to this paramount idea, both misunderstood and misrepresented; but to-day the people are prepared to do them justice, listen to their advice and attend to their suggestions.

The value, and in fact the perpetuation of the State Board and the Agricultural college, depends upon their being nurtured by a well-defined and rigidly enforced preliminary "industrial education." Without that the college is without foundation or copestone, the Board is as the play of Hamlet with the Hamlet left out.

Now it is quite frequently found that it is much easier to find fault with a system than devise a remedy. On this occasion we present a remedy embodied in a resolution that has been extensively commented on and widely adopted.

It recommends the appointment by the State Legislature of a State Board of Education, and the appropriation of funds for the maintenance of the same, as thus best meeting a pressing want in our State educational system—said Board to be composed of the members of the State Board of Agriculture, representative farmers, the professors of our Agricultural college and Normal schools, the State Superintendent of Education, county school superintendents and practical teachers in our district schools, whose duty it will be:

First—To arrange a comprehensive and progressive plan of study adapted to the necessity for securing a decidedly "industrial education," as is required by the farmers and mechanics of our State.

Second—To bring the district and other public schools of our State into perfect unity and harmony with each other, and with our Agricultural college, so as to aid and promote our industrial development.

Third—To devise and arrange the books and apparatus necessary to give full effect to this fundamental idea of unity, utility and completeness. Said books and apparatus to be published by the State and sold at cost.

Here we will briefly advert to the machinery proposed to be put into motion to work out a thorough, practical, industrial education. We aim at making the methods so distinct, harmonious and complete, that there will be nothing to unlearn, to go back on, that each point in theory and practice will be in perfect harmony, and thus directly tending to industrial development.

Here, in passing, we want to make perfectly clear our position in reference to classical and professional education. We have no hostility to it, raise not a breath of opposition—very far from it. In our plan, we see immense gains in the direction of professional or literary pursuits. An acquaintance with the methods and materials that compose all the elements and operations that form the basis of our industrial activities will be aids to excellence in professional life. We propose making the man-of-all-work first, and then, from that mass, by the natural selection of genius, call the few to the higher spheres of professional life, and these men will be greater, more successful, in their special spheres by being familiar with those subjects and operations which will keep them in sympathy and contact with the great mass of their fellow-men. We see the demand to-day for specialists, "experts" in every department and relation of civilized life. Look at the work of the juror to-day and that of a hundred years ago. The complications arising from the changed conditions of civilized life have caused the average jury to be regarded with distrust, and the most important element in our court processes is the testimony of "experts" to the bewilderment of the average modern juror. The lawyer would be more at home from this acquaintance and assimilation with industrial action and conditions. The preacher would reach the hearts and sympathies of his audience with a directness unthought of, when he can carry the convictions of things unseen through the analogies of the simple and manifest in life and nature. The poet and litterateur will be better able to point their cunning darts into the sympathies and affections of the people, and the great masses themselves would become more appreciative, and the great heart of humanity throb with the thrill of the thousand mental electric currents to which they are at present unsusceptible, and reading matter be more in demand and more profitable.

We present our case and propose to work out its details without any reference to political bias or influence; it deals with the people. We ask the people, through their legislature, to launch this ship; it will be manned by experts, by citizens, by patriots, all acting under one grand influence, patriotic intelligence.

We propose the State Board of Agriculture to be an organic portion of the machinery. Then, that a given number of truly representative farmers be there to see that their ideas and interests be fully and fairly represented; that they be selected on the basis of their intelligent devotion to their profession, and be chosen by the associations of farmers. We want the professors of our agricultural college, so that they can help to teach us "what should be taught," and the professors of our normal schools because they can best point out "how it should be taught." The State Superintendent of Schools should be *ex officio* a member, as he has to see how any system is carried out and how it answers the end in view. So with the county superintendents and district school teachers. They should be selected as being directly acquainted with the working of the system, and the ratio of these members be selected by the teachers' associations. There are some offices that can be properly elected by the people, some that can be filled by executive appointment, but there are other and important public offices that can best be filled by those competent to judge purely of capabilities and fitness; thus the dawning of true merit and capability can be recognized.

The first two duties presented are so self-evident as to need no farther explanation.

The third contemplates the State publishing the books and apparatus arranged by the Board at cost—not as a gratuity, because many would desire to own copies and have direct independent control of them. It will also secure more care in handling them.

No other text-books should be allowed in any of the schools aided by the State.

PROGRESSIVE METHODS IN AGRICULTURE.

[Read by M. W. SERL, of Lebanon, Mo., before the State Board of Agriculture, January 5, 1891.]

In the good old days, often brought to mind, when the doctor, the lawyer and the parson were, in their way, village oracles, and, in a sense, said to live by their wits, the farmer was accredited with brawn and muscle and commended for his ability and disposition to labor, but his calling was not supposed to require any high degree of intelligence.

The production of an over-grown calf or an exaggerated pumpkin was likely attributed to a freak of favoring nature rather than to superior skill and management on his part. Indeed, the time is not far remote when it has been said of young men of limited attainments, "They have education enough for farmers." Whatever may have been the connection of this idea with the present situation we will not now inquire; but while the farmer has been elevated by his surroundings, his labors lightened by the advance of mechanical arts, the question may be asked whether he has not been borne along with the tide, accepting results which have come to hand, without heartily entering into the spirit of progress himself? To adopt a new device, when urged by a fluent agent, is one thing; to comprehend and employ new and improved methods, verified by reason, observation and personal experience, is quite another. Hence it is not impertinent to inquire as to whether farmers, as a class, have kept step in the march of improvement; whether, aside from the appliances thrust upon them, they have materially advanced the system of agriculture beyond what was known in our grandfathers' days.

Were the conditions of society the same as formerly the question would assume less importance, for crude methods might still suffice. But the advancing age has brought new requirements. Our wants have multiplied, and we of the nineteenth century cannot maintain the simplicity of the eighteenth if we would. Things that were once luxuries, only within the reach of a few, have in a manner become necessities for all. Our expensive schools and churches, our asylums, and all the superior facilities for travel and communication, are only made possible by increased production. Nor is this all. The difficulties in the way of success are vastly augmented. Crops once profitably cultivated in various localities must be abandoned, for the reason that rapidly increasing facilities for cheap transportation bring ruinous competition from more favored regions, or the elements in the soil essential to production have become exhausted. Noxious weeds from other lands, and insect enemies without number, cold and heat, drouth and floods must all be met.

There is scarcely a vocation in the range of human industry calling for more multiplied expedients or a broader and keener intelligence. Indeed, the obstacles in the way and the requirements for success are so great that many have looked eagerly in every direction for relief. The cry, lo here and lo there, has not been wanting; but acts of Congress and of State Legislatures are by no means adequate remedies. They are but palliatives at the best; yet the farmer who toils early and late only to find himself, at the end of the year, no better off than when he began, is easily impressed by the cry of the demagogue, and led to believe that the established order of things is wholly wrong; that the remedy lies beyond himself, and is only to be found in the visionary schemes of politicians.

But it may be asked, how can this vast body of men be brought to a knowledge of the methods and principles best adapted to the bettering of their condition? The question is difficult of solution. The Grange, the Alliance and kindred organizations have certainly reached and influenced many, but the extent to which these channels may be utilized in giving prominence to exact methods in agriculture, I am not in a position to state. One thing, however, is evident. Were the farmers of Laclede county represented in every meeting of this kind within their reach, to hear and discuss whatever of importance may be brought from without—could every farmer become an experimentalist, not in a large and costly way, but as circumstances might permit, changing hap-hazard for exact methods—an array of investigators would be enlisted to discover every peculiarity and adaptation of our diversified soil and climate. Communism as regards lands and results of labor may never prevail, but a communism of ideas among men similarly employed is both practical and desirable. While we would not depreciate the importance of general information among farmers, local inquiry is indispensable, for it must be borne in mind the peculiar conditions of each locality call for more or less modified methods, and for the cultivation of certain kinds of stock, fruits and cereals, to the exclusion of others for which conditions are less favorable.

The importance of this idea is illustrated by the frequent failures of those who come among us from other countries where more exact systems are employed than prevail among us. The successful English farmer, for instance, has much here both to learn and unlearn; but life is too short for each to run the long gauntlet of failures which attend those who study only in the costly school of experience, unaided by the results of others. All great advances in art and science are a growth. Original ideas are foundations enlarged and built upon by observation and experience, until perfected systems represent results far beyond the possible attainments of a single mind. The first reaper and the first locomotive were clumsy machines, but they embodied the germinal idea since developed, through the genius of many, to their present perfection.

The printing presses of Faust and of Gutenberg would hardly pass for toys to-day, and the experiments of Franklin with the kite may have appeared childish to some, yet they introduced ideas that have shaken the world. To multiply illustrations is unnecessary. The principle is everywhere recognized. Navigation, chemistry, and in short every department of art and science stands as a monument to aggregated wisdom. Every advance is firmly held. Each new investigator stands upon the knowledge and is guided by the light of those who have gone before him in his chosen field. Every new invention opens the way for further advance. The world's progress to-day is in the hands of specialists—men laboring in a single direction with a definite purpose. It is in recognition of this fact that you are here; that agricultural colleges and experimental farms are established; that Farmers' institutes and associations are formed. These things are proper; they are in the march of progress, and it only remains for the great mass of farmers to take their places in the line, and assert the dignity of their vocation. The time is at hand when farmers should be lifted out of the slough of despondent drudgery to the position of intelligent workers; when theirs should be a learned profession. Nor can it be supposed that the homes from which the wisest and the best of all callings have gone, will be wanting in the effort. No more promising field for systematic agriculture than Southwest Missouri, with its diversified soil and splendid climate, can anywhere be found. The future is in our hands as never before. Thousands have passed by our doors, many to less favored regions; but the tide has been stopped by the mountains in the west, and it is for us to discover and point out the advantages here offered to those who, by their means, their intelligence and their industry, are fitted to aid in developing the grand possibilities of our section.

To most present a statement of these things is unnecessary. They are understood and appreciated. But to arouse the great mass of our farmers from their deathly lethargy to an appreciation of the fact that the former things have passed away, that the world is moving, that they must be alive to their own interests, not as the demagogue would make them believe, but as the progress of the age requires, is a matter that concerns us all.

HOW TO KEEP THE BOYS ON THE FARM.

[By Mrs. G. E. DUGAN, and read at the Pettis county Farmers' Institute.]

Having been requested to prepare a paper on the subject, I have given it considerable thought, yet confess that it is a very difficult thing to arrive at any definite conclusion concerning the vexing problem.

Denman Thompson, in his graphic story called "The Old Homestead," utters these truthful words: "If the boy who disdains the plow could but be brought to see into the minds of those who have gone away from home and have attained the object of their ambition, he would see for the most part that the real happiness of those successful lives lay in the memories of the days when the city was to them an unknown place."

This aphorism cannot be denied, and yet it serves little to help out the fateful enigma of this theme. The boy of to-day is the man of tomorrow. The man of to-day begins to take note of the pit-falls over which he has passed or into which he has stumbled, and he hopes to guide his son over safer roads and through far pleasanter paths to the goal of his ambitious hopes.

The boy will not see the pit-falls; he will not be either led or driven—not because he is stubborn or disobedient, but because he is hurried along in spite of himself by a boundless ambition—your heritage to him, when you too, with wild-beating pulses,

> "Dipt into the future, far as human eye could see,
> And your spirit throbbed within you to be gone before you, then
> Underneath the lights you looked at in among the throngs of men."

Ah, these throngs of men! Here is the lode-stone; here is the siren voice that is calling to your boys, "come with us; we are many, we are mighty; here only can you gain wealth and happiness." The fabled siren who softly sung and tenderly lured the boatmen to their death on the great sea rocks had no more alluring tones than those which float out from the crowds of humanity surging about our cities and large towns.

This Memnonian music reaches the ears of your sons earlier than you suppose, and they become convinced that the golden apple of Hesperides grows only in the great marts of trade. Their farm life is dull to the average boy—dull and chill and uninviting—much more so than it ought or need to be. The home life on many farms is simply an existence, and can scarcely be called life at all. A dull, monotonous round of toil. Men work from early dawn until dark; eat a hasty meal; go to bed; rise in the morning, and go through the same uninteresting routine.

Nobody reads anything, no one talks of anything more entertaining than the neighborhood gossip, or the quality and probable price of hogs.

The world is teeming with events in which you should be deeply interested, and yet on many a farmer's table there can be found no newspapers, no magazines, no books.

Mothers sometimes ask me how they shall keep their boys at home nights and out of the city streets. There is but one way: make home more attractive than the streets, and your boys will gladly remain in the home nest.

The boy of keen perceptive faculties and fine intellect, compelled to remain in an uninviting home, chafes like a chained eagle. He may not mention the fact, but he yearns incessantly for the broader arena of town or city life—yearns for it as the chained eagle pines and frets for the mountain peaks and longs to bathe its wings in the ocean and dry them far up in the airy blue of the firmament.

The bright boy thinks, makes comparison, draws contrasts, plans, and dreams always about the future. "What," says this boy to himself, "shall I always stay here only to toil, to drone, to eat, to sleep, knowing nothing better than a sluggish contentment for all the coming years of my life, and then die, having done nothing, attained to nothing, simply existed a mere cumberer of the ground? I will not thus live and die."

If you cannot prove to this ambitious youth that farm life may be made as attractive, as enjoyable, as progressive as are other occupations, unchain the eagle and let him go. That the inexperienced mind of the boy greatly over-estimates the facilities for aggrandizement offered by the towns and cities is very true; but what are you to do about this fact? The boy has not the calm, staid pulses of manhood; his heart bounds with fresh young blood; he laughs at the lions you see, and says, "they are only mice." The mountains of danger and difficulty which you endeavor to point out to him are in his sight mole-hills. You tell him of the many who fail, of the few who succeed in mercantile or professional careers; his heart throbs but the more eagerly as he replies with confidence, "I shall not fail."

You cannot reason with a moth that is attracted by a glaring light; the sight of singed wings and burned bodies seems only to make the insect more anxious to seek the flame. You may catch and hold it, but once released it flies quickly into the fire, dazzled and allured beyond all power of resistance.

Thus it is when boys determine to leave the farm they will go as soon as restraint is removed, whatever you may say.

For some of these boys there are open doors of usefulness and success waiting their entrance; for others, and far the larger number, there is failure and discouragement. But again I question, what can you do? Each life is a unit, and must be lived unto itself, in a great degree.

The restless stream of humanity flows on to the sea. It is a resistless current. We can neither change its course nor stem its tide. The hardest battles of life are fought in the silent depths of the souls of men. For those who win there are plaudits enough; for those who fail there may be a few pitying tears, but there are usually only heartless sneers and bitter blame.

The world in general is a regardless, remorseless tyrant to those who fall or make shipwrecks of their lives.

No man ever succeeds in an occupation that he dislikes. Therefore, if you would keep your boys on the farm, make the farm just as attractive to them as possible. Never fail to provide mental food for them, nor neglect to supply the feminine portion of the household with means to make home attractive. Let them have money for those little adornments without which home is as waste as a desert.

Let the best room be the family room, the best things used for the home folks, and not kept for a chance guest. If possible let there be music, but any way let there always be flowers and birds. These cost little, and their refining influences cannot be over-estimated. Also, permit your children to have pets, and give them an interest in the pigs and poultry. Let them have a little pocket money, especially for birthdays and Christmas time.

Don't growl and grumble at them continually, nor make them feel that they are somehow personally responsible for having been born.

Don't make them feel that they are a great expense, and a source of much trouble.

Children do not owe as much to their parents as their parents owe to them. I am aware that this is a new and rather startling declaration, but if you will consider it fairly you must agree that it is true.

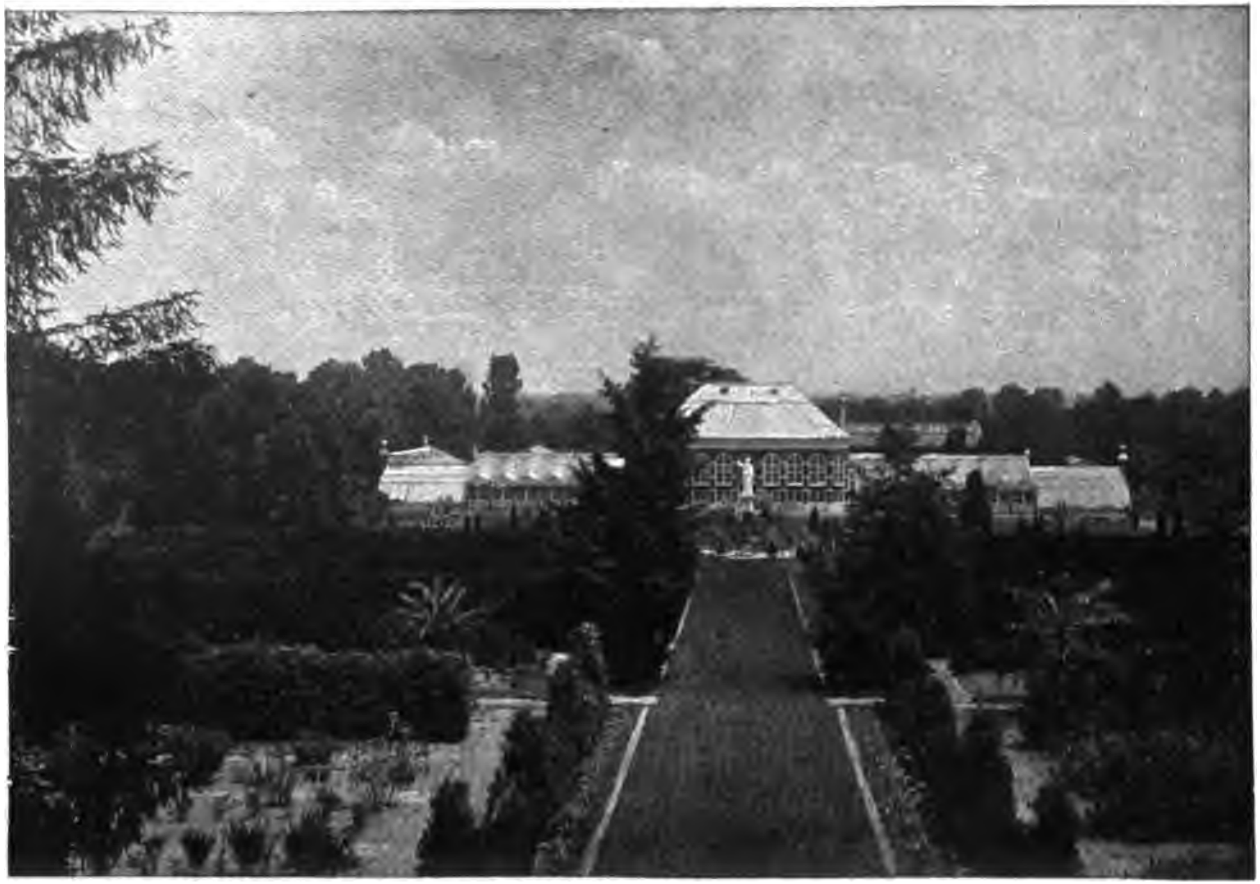
Having brought them into the world, you are responsible for their welfare and happiness. It is your duty to educate them, love them and protect them in their junior years. If you do this duty there is no danger but that they will crown your old age with blessings, and will return to you, in full measure, all the kindness and care you have bestowed upon them.

You cannot chain down the ambitious, restless spirit of your son, and if by practical demonstration you do not make him see that farm life will be the best life for him, he will not stay on the farm. Ambitious boys will leave any and every place if they believe that by thus leaving they can make their lives more useful and happy. They will not believe that agriculture is the best and happiest of all occupations unless you demonstrate the fact clearly and to their satisfaction.

Lastly, we must consider the eternal laws of progress. There is a softly whispered invitation, "come up higher," which makes itself heard in the recesses of your boy's soul, whatever the outside tumult may be. This slumberless force, which we call "ambition," agitates and influences your boys more than you dream; and they are longing more than you know to join the surging tide of humanity that is struggling to reach a higher plane and to achieve nobler things.

From the millions of striving souls in the great centers of human activity goes out the invitation, "cóme and join us," and the hearts of your boys are answering back to these urgent calls, in the language of the poet:

> "Men, our brothers, men the workers, ever reaping something new,
> Let us join the ranks triumphant, let us walk and work with you."



THE MAIN TURF WALK.
Shaw's Garden, St. Louis.

HORTICULTURE.

THE MISSOURI BOTANICAL GARDEN.

A recent visit to the Missouri Botanical garden impressed the writer with the value this institution is and is to be to the horticultural interests of Missouri; and in the belief that a brief statement concerning it would be of interest to the agriculturists of the State, the following is presented:

The late Mr. Henry Shaw, of St. Louis, who was for something over twenty years one of the most enterprising merchants in his adopted city, and for nearly fifty years after that period enjoyed the reputation of being one of Missouri's most wealthy citizens, created a small pleasure ground and garden about his residence in the suburbs of St. Louis some forty years ago, enlarged it greatly in both size and scope within the next succeeding ten years, and on his death in 1889, left it, endowed with a fortune appraised at several million dollars, to the management of a board of trustees, charged with the duty of forever maintaining it as a botanical garden for the pleasure and instruction of the public, and the advancement of botanical knowledge in its broadest sense.

The Missouri Botanical garden is located within the city limits of St. Louis, just north of Tower Grove park, and is easily reached by a short walk from the depot at Tower Grove station on the Missouri Pacific and Frisco railroads, or from the heart of the city by the Union depot or Market Street electric roads. The garden forms part of an enclosure of about one hundred acres, half of which is yet meadow, although it will ultimately be improved and planted to trees. The flower garden comprises about one-tenth of the entire area, and is planted so as to maintain a succession of ornamental foliage plants and flowers, beginning with the snowdrop and crocus in earliest spring, and ending with the last roses and coral honeysuckles, which are killed on the plants when the winter closes in a week or two before Christmas. During the growing season, palms, century plants, cactuses and other plants from warmer regions are suitably placed around this part of the grounds. Through the winter these are collected in the two large green-houses, which then contain a number and variety of economic and ornamental plants scarcely equaled elsewhere in this country.

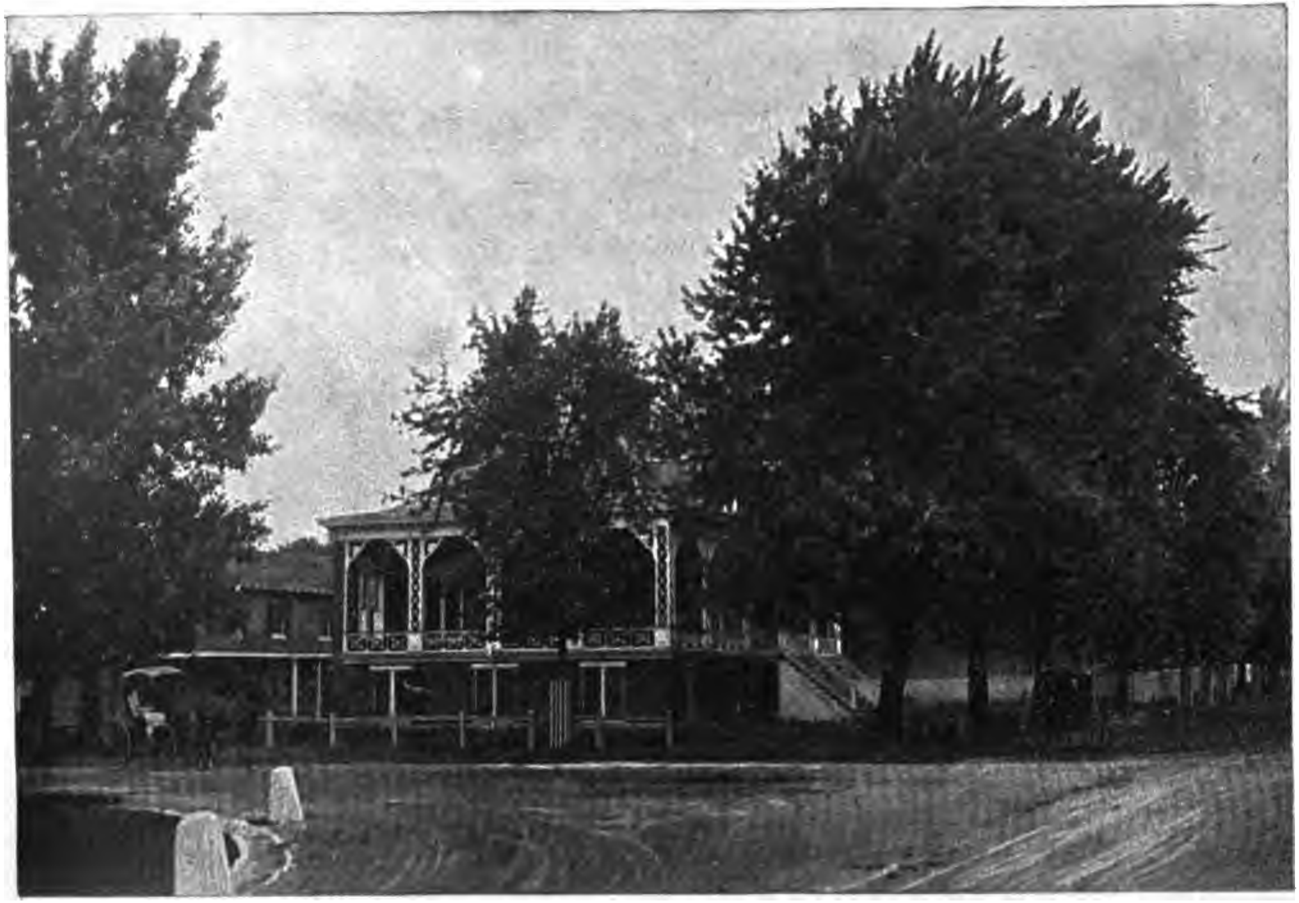
In the first annual flower sermon, provided for in Mr. Shaw's will, and preached in May of last year by the Bishop of Missouri, occur these words:

> "Consider the trees. Of living things they are the oldest habitants of our planet; types of silence and restfulness; workers steady and unwearied in developing cell after cell throughout the countless years; lessons of strong help to man when restlessness and despair assail. Flowers, plants, trees, ye are the exemplification of God's wisdom and goodness."

When the garden was laid out by Mr. Shaw, it was planned on London's division of comprehensive grounds into garden, fruticetum or shrubbery, and arboretum or grove. Some eight acres are comprised in the fruticetum, which for many years was kept up by Mr. Shaw on its original plan, but after a time was changed into a nursery and orchard, and maintained with much less care than the remainder of the grounds. The fruticetum has recently been given in part thorough drainage, and is planted as an experimental nursery. From the nature of the case, it can not be opened to the general public. Horticultural visitors will always find Mr. Duffey, the assistant in horticulture, ready to show them through it, if they will take the trouble to call on him and make their wishes known.

At the rear of the director's residence, south of the flower-garden, is another enclosure not open to the public, which is used for experimental and vegetable gardening, but which is also open to the inspection of horticulturists under Mr. Duffey's guidance. The arboretum, which includes about twenty acres, comprises a very extensive plantation of trees, under the shade of which bogs and ponds have recently been formed, and something over five hundred species of our smaller native forest plants set out.

While Mr. Shaw was a lover of flowers rather than a botanist, he provided amply for the herbarium and library necessary for the proper naming of the collections, and the house occupied by him for many years at the corner of Seventh and Locust streets is now being rebuilt as a fire-proof building within the garden, to be used for storing and arranging the large collections of books and specimens—perhaps six thousand of the former and one hundred and fifty thousand of the latter. These collections possess little interest to the casual visitor, and are far too valuable to be placed on exhibition; but, like the experimental parts of the garden, they are always accessible to qualified students who wish to consult them. For the present they are



LODGE FOR GARDEN PUPILS.

stored in the museum building built on the grounds many years ago, and which is now temporarily closed for that reason; but at their removal to the new herbarium building, the museum will be occupied by a well-selected and properly arranged collection of economic products of the vegetable kingdom, open to the public, and calculated to interest and instruct visitors to the garden.

Under the plans of its founder, administered by a board of trustees well known for their uprightness and intelligence, the Missouri Botanical garden is already a strong and useful botanical and horticultural center, and as it grows with the increase of the revenue from its ample endowment, it promises to contribute much to a knowledge of plants and of horticulture—the art of growing them. To diffuse this knowledge, a series of scholarships have been established by the trustees, open to young men of fair education, without any limitation as to their nationality or residence, who are allowed from $200 to $300 per year and given the use of furnished rooms in a lodge adjacent to the garden, where they have the use of a carefully selected horticultural library and a reading room containing the principal English and American gardening papers. The course for garden pupils extends through six years, so that while this is not required, it is better that candidates should be from 14 to 16 years old. One scholarship is reserved for a candidate named by the State Horticultural Society, and another for a candidate named by the St. Louis Florists' club. Both of these are now occupied. The remainder are open to general competition. Two vacancies will probably be filled early next year; information concerning them can be obtained by applying to the Director of the Garden. Are there not two bright, earnest Missouri boys who want and can secure the appointments?

HORTICULTURE IN NORTH MISSOURI.

[Read by T. W. Gaunt, at the Farmers' Institute conducted by the State Board of Agriculture in Maryville, Mo.]

It would require volumes to write you a thorough digest of the word horticulture; therefore, my paper being quite limited, all I can do is to offer a few practical remarks. We are glad that we have been able to contribute our mite toward assisting in developing the fruit interest of Northwest Missouri and Southern Iowa. We would say, that as far as we are concerned, we have been able to overcome all the apparent difficulties that have been presented; we have had much to do, to induce others to think and practice what we have advised, in the years that are past. We had the hardihood, near thirty-six years ago, to face a howling wilderness, the intent of which was to reduce to a fact, that the soil of Northwest Missouri was capable of producing the finest quality of fruit in abundance. Back in the early days of 1855, Northwest Missouri was but thinly settled, and few fruit trees were planted; consequently no fruit could be obtained. We first began the nursery business in Andrew county. At a leisure time, we took a trip through the several counties in Northwest Missouri, and after a careful examination of the soil, concluded that the Platte purchase would, in time, make the finest fruit garden on earth. We were fully convinced that the Creator had prepared Northwest Missouri for the production of fruit, if the people could be convinced of the fact. We had a fearful task before us; nearly all the settlers said it was too cold to raise fruit in Northwest Missouri, and that the soil would not produce anything but corn. This was the hog and hominy period. Often the remark was made to us, "young man, you will fail." We modestly remarked that we had been to school in our youthful days, but had utterly failed to learn the meaning of the word. There is no need of failing in the grand old State, and especially in this part. We are happy to realize that our labor has not been in vain, and the hundreds and thousands of dollars paid out to our old patrons for their apples this fall proves it.

The second chapter of Genesis contains a grand description of the first fruit garden on earth, planted by the Great Architect of the universe. The garden was called Paradise or Eden, meaning a place of bliss.

We sometimes roll back the centuries and imagine that we are looking over that beautiful home of our first parents. Every tree which was pleasant to the sight and every one good for food was in the grand display, and we doubt not but that there was a rich profusion of flowers also. The infinite Father saw that an abundance of fruit was highly necessary in the economy of man's every-day wants.

Fruit is an indispensable article of diet in this climate. It would be well for those who contemplate planting an orchard to observe the situations of the orchards that escaped the late frosts of last spring and have yielded an abundant harvest this season. Trees planted on similar situations will be equally successful in producing an abundance of fruit.

There is scarcely a person here but can look back to the happy days of childhood, and think with pleasure of the days when you ate with satisfaction the delicious fruit of your favorite tree in the old orchard. What can be more satisfactory than an orchard of well-selected apples, from the earliest to ripen to the longest keepers?

A few varieties of pears, plums, cherries and quinces may be added. All the small fruits are grown successfully here. Home, surrounded with an abundance of finest fruit and flowers, must shed a refining influence on the inmates of that home. He is a wise man who has provided his household with an abundant supply of choice fruit suitable for all seasons of the year. We well remember how devoid the tables of the first settlers were of fruit; but now, since the spirit of progression has taken possession of the people, there are thousands of orchards in full bearing, whose fruits are bringing health and wealth to their owners.

The situation for an orchard should be dry; if not naturally dry, it should be made so by artificial under-ground drainage. Tiles four-inch inside diameter are the best size to use; the drains should be five feet deep, with a good outlet.

Fruit raised on high, dry soil is much superior in quality to fruit grown on a soil that has a retentive substrata, even if under-drained.

The apple and cherry will not live so well nor thrive so well on a soil constantly saturated with stagnant moisture.

An orchard should not be planted any closer than thirty to thirty-three feet, and when in full bearing should have entire possession of the ground, and should be cultivated the first part of the season, which will stimulate a good growth and a full development of fruit-buds; but while the trees are young, the ground between the rows should be planted to hoed crops or corn, leaving a wide space for the trees. The ground about the trees should be kept clean and free from weeds and grass by frequent hoeing. This, in a measure, is a good preventive against borers. If weeds and grass should accumulate about the collar of young trees late in the season, they should be cleaned away before the ground freezes up; this will prevent the field mice from girdling your trees.

Timothy or blue-grass should never be allowed to take possession of an orchard. It saps the ground and impairs the vitality of the trees.

It is not wise to allow an orchard to overbear every alternate year; it brings about an impoverished condition that requires a year's rest. The so-called off year can be made a profitable year by thinning out the excess of fruit when too thickly set, but we would rather relieve the over-burdened trees by thinning some of the smaller branches out. This will greatly increase the size, and the quality of the fruit remaining on the trees will be much better.

Many years of profitable production may be added to the life of an orchard by careful management. When an orchard fails to produce first-class fruit, no time should be lost in assisting nature to regain lost vigor. The production of fruit is exhausting to the soil, and we cannot rob the soil of its fertility without making a just return; while our soil is almost inexhaustible, it is wise to keep up the fertility by top-dressing with manure or ashes every few years.

Nature will always render a bountiful return for all the assistance we give. A practical orchardist has but little pruning to do, for as soon as he perceives cross or ingrowing branches they are cut away, leaving but a small wound. We would say to those who have neglected to prune until large branches have grown, the proper time to prune is the last week in May or the first part of June, when the trees are making a vigorous growth; then there is no bleeding and sap-letting. Nature, then in full life and vigor, begins at once to heal the wounds. However, we would recommend that the wounds receive a coat of gum shellac; this will prevent the rain from penetrating the pores of the wood; but we never knew of a rot when pruning was done at the above named season of the year.

There should be a shelter belt of trees round an orchard, but where ground is scarce, one row of Norway spruce would be a great benefit. Orchards that are sheltered from storms produce larger and finer fruit. They live longer and grow faster, simply because the sap flows free and uninterrupted, which is a great consideration. Without a shelter, much of the finest fruit is blown down with every severe wind that sweeps through the trees.

The time is near and already at hand when we shall have to spray our fruit trees with some kind of poisonous preparation, when the fruit is quite small, to stop the ravages of the apple-worm, that is destroying so much of our finest fruit. Prof. S. A. Forbes, State Entomologist of Illinois, says, in general, the results of once or twice spraying with Paris green, in early spring, before the young apples had dropped on their stems, resulted in a saving of about seventy-five per cent of the apples exposed to injury by the codlin moth. We would say, what can be done in any other State can be done here. We think that every one who has an orchard should spray his trees; the expense is only a few cents per tree. We sent last spring for a complete spraying outfit, and used high-grade London purple. This did not prove altogether satisfactory, although it came very highly recommended. We commenced spraying our trees when the fruit was near the size of peas, and in ten days sprayed a second time. We used a quarter of a pound of the purple to forty-five gallons of water, but, notwithstanding our efforts to prevent, we had our share of worms. However, we are not discouraged, but shall try again.

We find that to be successful in raising pears worked on the quince stock, requires thorough mulching throughout the growing season. This will preserve an even temperature in the ground and prevent a rapid evaporation of moisture, which is a great essential in developing and maturing the fruit and preserving the vitality of the tree. We find it the best to set the dwarf pear tree a few inches deeper than the junction of the bud with the quince stock. There is quite a dissimilarity between the pear and quince, but this induces early bearing, and in time the bud will get on its own roots; then the tree will become half-standard, which is better. Dwarf pear trees will blight and die of exhaustion after bearing a few crops, without special care. They have a tendency to profuse bearing every alternate year—same as apples. Thinning the fruit, with thorough cultivation and mulching, will prolong the life of the trees for many years. Quinces can be produced with special care. They should be well cultivated and mulched throughout the growing season.

The Morello family of cherries succeed finely on dry ground when worked on the Mahabeb stock. They come to early bearing, and are best of all for this locality. We find that the Hart and Bigarreau family of cherries do not do well here; they make a rapid growth during the summer, which renders them too tender to stand the severity of the winter.

Plums do well here, especially the American varieties; we have not succeeded well with European plums on account of the curculio. However, when we fall in line with our vaporizing engines to fight the codlin moth and apple worm, we can clear out the curculio also, and eat fruit that has grown to perfection.

Grapes, hardy sorts, do well here in dry, rich soil; it is not often that we are troubled with rot or mildew here.

We think that the State Horticultural Society is doing a grand and noble work. They are at labor in the morning of the day of horticultural splendor. There is a great future for Missouri. Future generations will realize more profit than has been realized in the past. The profits of an orchard are considerably more than if the ground was planted to wheat or corn. We think that first-class apples will never rate lower than 25 cents a bushel. Nothing but the finest and best of fruit should be sent to market and that will command the highest price. All the inferior fruit should be fed to stock, and is worth 25 cents a bushel as feed. Stock of all kinds are very fond of apples, which are as beneficial to them as to the human family.

A word about evergreens:

Evergreens should be handled with great care; the sap is of a resinous nature, and by exposing the roots to sun and wind the vitality is soon impaired. By drying the roots the sap soon becomes too thick to flow, and it is impossible to restore it to its normal condition. After transplanting they should be mulched; and during a drouth, we find that showering with water that has been in the sun all day is highly beneficial. By observing the above many dollars may be saved, and a cheerful disposition toward nurserymen maintained.

FRUIT-GROWING IN MISSOUI.

[An address by B. S. MILES, of Gray's Summit, Mo., before the Farmers' Institute of Missouri, 1891, New Haven, Mo.]

I have been engaged in the business of fruit-growing, and especially apple-raising, for the last forty years, and have now growing on my farm in this county, apple orchards containing about seven thousand trees, of ages ranging from seven to forty years.

I would say to the beginner that the first thing to be considered in planting out an orchard is the selection of a locality. Don't fail to select the best piece of ground you have on your farm. There is not half so much depending on the lay of the ground as there is in the quality of the ground. Almost any ground in this county that will produce a good crop of corn will be suitable for an apple orchard.

Select thrifty young trees (not over two years old). Plant the trees not nearer together than thirty feet each way. Plant either late in the fall or early in the spring. Be sure that the roots of your trees neither get dry or frozen after being taken from the nursery and before planting in the orchard. Be very particular about planting. Plant in the orchard about two inches deeper than the trees grew in the nursery. See that the dirt is well pulverized and well filled in amongst the roots and reasonably well packed down, but not too hard, with the roots in their natural position.

As soon as the tree is planted prune it. Always remember that there is very much depending upon the proper pruning of an apple tree. Commence right and attend to it often, and you will never have very much pruning to do. At the first pruning (at the time the tree is planted) it is absolutely necessary that the top be cut back as much as the roots have been cut back in taking the tree from the ground in the nursery, and often more than that.

Never plant a forked tree. If the tree was forked in the nursery, be sure that you take off one of the prongs when you plant it in the orchard. After the first pruning—which should be done when the tree is planted—there is more danger of pruning too much than too little. If properly pruned while the tree is young and small, it will very seldom be necessary to cut out large limbs from trees when they get older. There is often serious harm done in cutting out large limbs from bearing apple-trees. If a large limb is all taken off entirely back close to the body of the tree or back to a larger limb, the wound thus made will nearly always make a dead place, and in a few years it will rot out and make a hollow place, which injures the tree far more than the living limb ever would have injured the tree if left on.

If at any time you decide that a large living limb must be taken off, don't cut it off entirely back to the body, but cut it off far enough from the body so that there may be some living limbs on the stub to keep it alive. As to the best time in the year to do pruning, I think there is not likely to come any harm from taking off small limbs at any time of the year; but where heavier pruning is to be done, the proper time is in the fall, after the leaves have fallen, or early winter. A few words on the cultivation of the orchard and I will close. As soon as or before you plant out your orchard, build a good strong fence around it, and never at any season of the year allow any stock of any kind in it, except to cultivate it, or to haul out the fruit. For the first five years plow and cultivate the ground well up to the first of July each year, but don't stir the ground later than that, lest you keep the trees growing too late in the season. The trees need rest after the first of July to ripen up the young wood and prepare for winter. After the orchard has been planted five years, sow it down to clover and plow under the clover once a year, late in the fall or early in spring. Never cultivate any crop in the orchard except apples.

HORTICULTURE.

[The following paper read by Mr. P. J. WEBER of this place at the Farmers' Institute conducted by the Board of Agriculture in this city on the 14th of January, 1891, attracted universal attention and elicited such praise that we feel extremely proud of our young friend.—Tipton Times.]

LADIES AND GENTLEMEN: I have the honor to say a few words regarding horticulture; though not prepared to entertain this audience with a breezy speech, I will try to give a few points of general interest on the above subject.

I am sorry to say that horticulture has long been regarded as a side issue, but it seems that of late our people are awakening to the importance of this branch of agriculture. It should no longer be looked upon as a luxury, but as a necessity, and as a well-paying enterprise—more so as the climate of the State in general, and especially of Central Missouri, is so well adapted to general fruit-growing. Even if we cannot compete with California and the South in fancy fruit-growing, we can produce all the staple fruits. I stated before that horticulture is a paying business, and shall now endeavor to illustrate this assertion. Take apples, for instance, being the most common and surest production of our orchards: There is the Ben Davis for example, this variety being the most profitable market apple, and plant, say one acre with trees, which would take 50 or thereabouts, planting them 25 feet apart, at a cost of ten cents each, or $5 for the acre. Planting will cost about five cents a tree, or $2.50 for the lot. This makes the cost $7.50 for the acre. Then consider, the land can still be utilized for farming up to the time the trees begin bearing, and even later; say the trees begin bearing the sixth year. The use of the ground and the cultivation thereof will be an advantage to the trees, and will more than pay for taking care of the orchard till it comes into bearing. Suppose now that in six years those 50 trees will average one bushel of apples each, which I consider a low estimate, making 50 bushels to the acre, which, if rated at fifty cents a bushel, brings $25 for the sixth year. From this time on the trees will bear more from year to year, until in about five years more this same orchard will net you $50 or more. What else could you plant your ground to and make it bring that amount of money. Take corn: you consider eight barrels a big crop; at $2 per barrel, this would only bring you $16, and with a great deal more hard work. You may assert that there may be a failure in the apple crop, but have you not the same trouble with other crops?

Having fully demonstrated that an orchard pays in this country, I will call attention to the fact that an orchard is an ornament to any farm, especially one situated on a timberless prairie, not saying anything about what benefit they are as a wind-break in winter. As to usefulness, how nice it is when every farmer has his own fruit, such as apples, pears, plums, peaches, cherries, etc., which can all be grown without much trouble and expense. The most important thing in putting out an orchard is, first to get fresh home-grown trees of some reliable nursery. A great fault with a great many people is that whenever they intend planting trees, instead of going to some nursery and selecting their own trees, they wait till some slick-tongued tree dealer comes along who sells them stock at about two or three prices. The trees probably come from some far-off eastern State, and are not at all adapted to this soil and climate. Of course those fellows carry fine colored plates of fruits, which indeed look very delicious and tempting, but that is about all. Another thing, their trees are generally misrepresented and hardly ever prove to be true to label. The new varieties they offer are also to a certain extent a nuisance, as a great many prove to be worthless. Stay with the standard varieties and I think you will come out ahead. The second thing to look after is to get the right varieties. Will name a few that have proven to be good and hardy for this country: For early apples, take Early Harvest, Red June, Red Astrachan and Sops of Wine. For late summer, there is the Summer Belleflower (the best of all late summer apples), Maiden Blush, Duchess of Oldenburg, etc. For fall, take Wagner, Yellow Belleflower, Baldwin, Rome Beauty, etc. The Red Beauty is another apple that cannot be too highly recommended. For winter, take Ben Davis, Jonathan, Baldwin's Jennet, Willow Twig, Smith's Cider and Small Romanite—the Jonathan being to my notion the best of the lot. It cannot be excelled for flavor and beauty, and is also a good bearer, but it is not quite as sure a bearer as Ben Davis, but it fully makes up in flavor, etc. It is also one of the leading market apples and always brings a good grice. Its keeping qualities are not so good as some others, but with proper care it can easily be kept till February and March. For late keeping the Small Romanite takes the lead.

A few words about pears. They as a general thing do moderately well. The best of which are Keiffer, Bartlett, Seckel, Duchess, Clapp's Favorite and Dear, the Duchess and Keiffer being the hardiest for this section. We have on onr place two Duchess trees that are full every year. The fruit is very good, much better than Keiffer, but to my notion the Keiffer is our future pear on account of its productiveness, hardiness and early bearing. Why, I have seen trees of this variety bearing a half dozen good specimens of fruit the second and third year after being planted. When the Keiffer was first introduced here, father put a bud in another tree in the yard which produced fifteen large pears the third year.

Peaches are a fruit that do not always do well, but what fruit is nicer than a large juicy peach? Suppose they do not bear more than once every three years, which I think is a good average, they will more than pay for themselves. The kinds that are good for this country are Amsden, Alexander, Crawford Early, Early Rivers, Hale's Early and George the IV, Crawford Late, White Heath and others. Peaches should have protection during cold winters to do well. Plums do very well also, especially the Wild Goose, Minor and Mariana, the Wild Goose being the best plum for this country, and in fact, can not be excelled by any that have been introduced. The Mariana comes highly recommended, but it has not been fully tested here. The Damson, German Prune and the Gages promise very well, but are more subject to the attacks of insects. To insure good results with most plums, they should be sprayed with a solution of London purple or Paris green. For cherries, the sour varieties are best, such as English Morello, Early Richmond, Morency, etc. The sweet varieties do not succeed so well. A cherry tree should be planted on thin soil or in the yard where ground is packed to obtain the best results. By cultivating they grow too fast and do not promise so well.

Most all small fruits can also be grown without much trouble. Blackberries, raspberries, gooseberries, currants and grapes should be found on every farm, as they do well without much attention. A strawberry bed is another luxury which no man with only a few acres should be without. The variety that is the best for the general farmer is, I think, the Crescent Seedling. It does not require much attention, and is therefore called the lazy man's strawberry. It may be in place here to say a few words about planting and the general taking care of trees: There are widely different opinions as to which is best, fall or spring planting. I say both are good, if it is properly done and in the right time. A tree should be carefully planted at any time, and it will be almost sure to do well if it is in good shape. As a general rule, a tree should be planted about three or four inches deeper than it stood in the nursery. By all means an orchard should be cultivated, at least while trees are young, and also afterward to get the best results. Sowing to clover is a good plan, but it should not remain that way too long, as the sod will get too thick and prevent rain from soaking through and giving nourishment to the roots and fibers. Fertilizing is another thing that should be done, especially where soil is thin. Fresh stable manure, if applied in spring or summer, will prevent borers to a certain extent. The above has reference to apples and peaches, but cherries, etc., thrive better where ground is packed.

SPRAYING FRUITS.

[By Col. M. W. JOHNSON, read at the Laclede county Farmers' Institute.]

I must say to you that until by accident, a week or so since, I saw my name mentioned in connection with this meeting, I had not the least intimation and certainly no expectation that I should be asked to take part therein. And when I know there are so many connected with this Society who could have occupied my place so much more to the edification of my hearers, I can but regret the selection. For one who must toil day by day with his hands, having fewer leisure hours than a hired hand of the most exacting employer, is certainly unfit for the duty here imposed. For we all know that nothing of value save the gifts of God comes unbidden to the average mortal, and we know furthermore that it does take time, investigation, thought, to prepare anything worthy of the attention of this Society. But knowing that any and everyone may frame an excuse, which, if accepted, would be fatal to every enterprise depending for its success measurably upon public spirit, I am here in the spirit of the widow who cast into the treasury her mite.

The subject assigned me, as you have heard, is "Spraying for Fruit," and in discussing it, I deem it of greater importance to point out some of the encouragements of the situation as well as its needs, and to emphasize the necessity of spraying, rather than to describe apparatus necessary and the manner of doing the thing. With the lights and helps provided by others, the mechanical work is a small matter. Then at the outset I would say we are not alone in this fight. Invention has given us all we can ask in the way of implements, and our agricultural and horticultural journals teem with advertisements of the most approved machinery for every department of work. A munificent government has given one of its grand departments to our interests, and with the States, has established experiment stations all over the land; and earnest skillful investigators in laboratory and field are pushing their inquiries into every vital question and giving to the world, from time to time, the best results of their labors. In short, all we need is prepared to our hand. The plain path is marked out for us, and we have only to walk therein.

Now of him to whom much is given much will be required, and it certainly behooves us to use well our opportunities, else in our sure defeat and disaster we will be overwhelmed with double confusion and shame. Furthermore, we all know or should know that eternal vigilance is not only the price of liberty, as was said by one of our wisest statesmen, but is also the price of almost everything else worth having, and especially is it the price of successful fruit-growing. It is proper to consider also that the difficulties around us are cumulative, are growing.

The time was when Mother Earth yielded her gifts less reluctantly. Indeed, the first horticulturist had only "to dress his garden and keep it," and "every tree that is pleasant to the sight and good for food" grew therein. What endless variety, what matchless profusion, what bewildering luxuriance and inimitable beauty we may imagine, for this was before sin entered into the world. But later on we hear of tares coming, though only good seed were sown; and are told that "an enemy hath done this." My friends, by no very great stretch of imagination may I not say that that enemy is still sowing tares; is still marshaling his hosts and multiplying his engines for the destruction of our best interest—in thorns and thistles and noxious weeds; in myriads of grasshoppers that blacken the land where they go as if charred by fire; in other myriads of chinch-bugs that sweep over our richest fields like a curse from heaven, leaving them fit only for the flames; in the repulsive potato beetle, that destroys a crop which is scarcely less vital to some people than our cereals are to us; in the insidious curculio, the codlin moth, the canker-worm, the flat-headed borer, and the thousand and one other destructive insects and agencies that prey upon our field crops, our fruits, our melons and vegetables, often to their entire destruction despite our utmost efforts to thwart them. Yes, these are verily the work of an enemy, and we must not forget that this awful enemy is on the increase. Not a year passes but some new terror is added to the dark list, and I do believe if not combated they will take the land. Even my short pilgrimage reaches back to a period beyond the appearance of the first chinch-bug in our locality, or first potato beetle or curculio, and many other now familiar pests I might mention.

Another significant fact I would mention—a piece of my own history; but my history is the history of others. Less than a score of years ago we grew on our premises, within a mile of where I stand, good crops of the finest plums I ever saw, and there was nothing to molest; and more recently on the same premises, as nice, large, luscious pears and blackberries as any could desire, and the largest, most finely colored and delicious peaches that could be found between this and the Atlantic coast. But where are they now? As to the plums, the curculio can answer. The rust will delight to tell you of the last days of the blackberries, and the blight in mockery will chant for you, if you please, the requiem of the pears. As to the peaches, those that escaped unpropitious seasons were appropriated by the rot and destructive insects; we were literally driven from the field, but not discouraged, and not, I hope, to stay.

The same rich and responsive soil and the same delightful inspiring climate that were so generous to us then, invite us still; yea, and the same God, whose blessings made the garden of the first horticulturist such a paradise, stands ready to bless our discreet and earnest efforts and make them fruitful; and through that blessing and the weapons put into our hands by invention, by scientific investigation, and last, but not least, Mr. President, by your noble society and kindred agencies, we trust those premises shall again become fruitful and beautiful in the harmony and variety of many delicious fruits. And I am sure that others, who in the past have met with discouragements, groping in the dark, will walk with me in the light you are disseminating, receiving great good ourselves and aiding, by reflection at least, in the further dissemination of that light.

Now if the foregoing, as to the enemies of horticulture and agriculture, is a fair statement of the case, and we all know it is not overdrawn, but rather, falls far short of the whole truth, the natural inquiry is, what shall we do about it? Well, should a foreign nation invade our shores, jeopardizing our material interests, consuming our substance, none would be so unpatriotic as not to know what to do about it.

When the wily Sioux begin their threatening ghost dances and their war dances, every impulse is not only for self-defense, but for aggression, until they are disarmed or exterminated. So should it be in the case in hand. I tell you the insidious foe we are considering is robbing us yearly of vastly more than enough to pension every Sioux on the continent so he would bless his Great Father at Washington the remainder of his days, instead of wishing to fight him. Why, a careful estimate of the losses in 1887 by chinch-bugs alone is $60,000,000. And this is but a beginning. Who that knows anything of the apple crop is not forced to the conclusion that during the past season not one apple in ten, grown on the American continent and not protected by the vigilance of the grower, escaped the codlin moth and his allies? And so of innumerable other interests. But why tarry to give more emphasis to this fact? Who that has his eyes and ears open does not see and hear enough to set him thinking? And earnest thought is the father of action.

As before stated in this paper, we have the appliances for effective defense and aggression. As our government bares its mighty arm to repel the savage, so also through its agricultural branch, now raised to the dignity of a department, and its experiment stations, it is giving us the means of repelling this more dangerous and more destructive than savage foe. And chief among these is spraying with the arsenites, emulsions, etc.

Spraying is the process of applying to the foliage and fruits of our growing crops, by means of a force-pump and spray-nozzle, such liquids as will destroy the invading insects; and the perfection of the operation is the distribution of the material thoroughly, but lightly: that is, covering the entire surface of leaves and fruit with the least possible quantity thereof. Those insects which feed on foliage or fruit are poisoned, while others that can't be thus reached are paralyzed and killed by contact with the material used, as in the case of the emulsions. You will see at once the wide range of its usefulness.

Experimenters have been feeling their way for the last eighteen years to establish the efficacy of the arsenites as insecticides; and now the question of their usefulness seems to be out of the realm of experiment, and they stand at the head of remedial agents for the destruction of noxious insects. Full information as to their use may be gotten through the department of Agriculture at Washington, and it seems to me that information on these subjects from that source is so exhaustive and reliable that none can afford to be without it.

My little experience in spraying is of little or no value to others touching the efficacy of the remedy. It was an act of desperation to get some fruit, rather than a thoughtful, calulating experiment. As no data was preserved, it lacks a prime element of instruction; but a description of the manner of procedure and of the apparatus used may be some guide to others making a first attempt.

The first season, 1889, we used a Lewis combination hand pump. It is a good implement, and I can recommend it for garden work and for those who have but few trees to spray; but it fails entirely in capacity for a large orchard or for very large trees. Thorough work on 40 to 50 medium-sized trees per day was as much as we could do. Our manner of using it was as follows:

To a 40-gallon barrel we fitted a lid with a hole in it to accommodate the handle of something like an old-fashioned churn-dasher; we mounted this barrel on a one-horse spring wagon, filling it with a mixture of pond water and London purple, in the proportion of one pound of the purple to 200 gallons of water. The poison should be first mixed to a paste in a small quantity of water, and then poured into the cask; with the dasher we kept the mixture continually stirred to prevent the settling of the purple, and to preserve the uniform strength of the mixture. The pump has at the lower end a hook to hook into a staple at the bottom of the vessel holding the mixture ready for use, and also a discharge hose about 3 feet long. As our barrel was too high for the length of our pump, the lid being easily removed, we dipped the poison from the barrel with a 2½ gallon pail or bucket, and pumped from this. One person drove the team and another used the pump, directing the hose with one hand and working the piston with the other. We first tried one pound of the London purple to 150 gallons of water, but found this too strong. It burned the foliage somewhat, and we reduced the strength to the first mentioned proportion, which we think about right for apples. Have used it on nothing else, but understand it should have 50 per cent more of water for use on peaches. We used about 2 to 5 gallons of the mixture per tree, according to its size. The proper time for spraying for the codlin month is soon after the bloom falls, say when the apples are the size of a pea, and then again ten days to two weeks later to catch a second brood of the pests; and as apples remain a very short time the size of the pea only, prompt and rapid work is of the first importance.

I should say further, that the codlin moth is by no means the only enemy put to rout by this liquid poison. The canker-worm was thus destroyed before the remedy was directed against the moth; and to every insect that preys upon either fruit or foliage it is death. Spray a tree in which a caterpillar has pitched his tent, and see what desolation you spread there! And that terrible apple scab, as we call it, that ruins so many varieties of our apples, will, I feel quite sure, find a specific through spraying; and indeed this useful remedy begets a hope that the whole world of parasites and noxious insects will ere long be brought under reasonable control.

As to our second year's experience in spraying, 1890, I have only to add that we used more effective machinery, and accomplished our work with great ease and satisfaction. We got from the Field Force Pump Co., at Lockport, N. Y., one of their Victor machines. It consists of 120-gallon tank and the force-pump, which is rigged to be worked by either hand or horse power, with two outlets and hose. One enters the tank and discharges near the bottom as the pump is worked, to keep the poison well-mixed. The other is fitted with a spray-nozzle for work among the trees. A cog-wheel strapped to the hind wheel of the two-horse wagon, on which the tank sets, supplies the power to work the pump, and by a lever it can be shipped or unshipped instantly, and at will. As with the small pump, above described, two men are enough for the work, or a man and a boy. Two horses, however, instead of one, are required in this case. Five hundred to 1,000 trees are a fair day's work. In an orchard six years old, but bearing a good deal of fruit, we sprayed at the rate of 2,000 trees per day.

Now as to results: As stated above, our work was an act of desperation to save our fruit, and in our hurry we took no means for procuring and preserving data. We don't know how many insects we killed, nor how much fruit we saved, for we know not what would have been the yield of our orchard without spraying; but we do know that we had quite a good fruit crop—much better, we are informed, than our neighbors, who did not spray.

MISTAKES MADE IN GROWING AN ORCHARD IN LACLEDE COUNTY.

[Paper read by FRANK BEVIER at the Laclede County Farmers' Institute, January, 1891.]

It was in the year of 1870, having secured a piece of land, that I determined to plant an apple orchard. My first mistake was made in ordering trees, selecting such varieties as were familiar to my boyhood days in the central part of New York, not knowing or thinking of the effect of the climate on the fruit—selecting Rhode Island Greenings, Northern Spy, Golden Russets, Roxbury Russets, Golden Pippins, Baldwins, Yellow Bellefleur and Winter Rambos, all of which are in Central New York good keepers, while here they are an early fall apple, not fit for shipping or even for late winter use; and the nurseryman did not know, or if he did never said, but that I had made a good selection. Although these varieties grow fine and bear well, it's a mistake to plant them for profit in shipping or keeping for winter use.

My next mistake was in ordering one hundred trees from Rolla—Ben Davis, Winesaps and White Winter Pearmain. When the trees came the top of every one was cut off; my better judgment told me it was wrong, but the nurseryman said, "Oh, it's all right, they must be cut off to make them better trees; they will spread out and bear more and be better every way." Well, I planted them, but they failed to flourish as predicted by the nurseryman; they never got much taller but did spread out some, and two or three are alive yet, and I can see the top which was cut about the size of my finger and the tree struggling to grow over it and the top getting dry and hard, partly decaying down in the body of the tree. Perhaps on good, strong bottom land it will do to cut the top off, but never on thin upland. As the tree never gets very large, I find it better to cut every limb off and then prune with my fingers, thereby shaping the tree to suit me.

My next mistake was made in ordering 100 trees from Springfield; they were what is called yearlings; they had stood too close together in the nursery, and about fifty of them had roots only on one side. I thought that was not right, but the salesman said, "Oh, that's all right, plant them and the roots will grow;" but they never did. Every tree grew leaning over, and when they bore fruit, fell clear over, and I could plainly see there were no roots on one side of the tree. After this I planted only such trees as my judgment told me were fit to plant, paying no attention to what tree salesmen said. It is a mistake to believe all a tree salesman tells you, as some of them never planted a tree in their lives.

About this time my large trees began to die; some of them would leave out, blossom, the fruit would form, grow to the size of a walnut, and then the tree would die. I could not see anything wrong with the tree until I commenced to examine the roots and found that some kind of a grub-worm was eating under the bark and completely girdling the tree below the surface of the ground. I then applied to a nurseryman as to a remedy. He told me to lay a piece of soap in the tree and let the rain wash it down on the body of the tree, but my trees kept on dying. Acting on this hint, I began a series of experiments with soft soap and ashes. I found that where lime and ashes were applied around the trees, those not too badly eaten by the borer healed over, and the borer left them. I then went to work to keep them from going in the trees, and mixed a wash of soft soap, ashes, lime and coal oil, and washed my trees twice in the spring and twice in the fall, so as to be sure and hit the time the beetle stung the trees, and have not lost a tree, young or old, since using it.

After a time I discovered that the borer was the same as found in the post oak, black jack, white oak and hickory grubs growing in this country; also found the wash an excellent thing to keep the rabbits from biting the trees, far better than wrapping them, as that causes the bark to get very tender, and when taken off in the spring the tree falls an easy prey to the first borer that comes along. The greatest of all mistakes is to plant apple trees on a piece of wet land without underdraining, as the fruit never grows perfect, being knotty and rotting on the trees; and the big mistake is to plant an orchard and think the trees will grow and bear large crops of fruit without any care or attention. Simply planting a tree will never get apples without a constant and careful attention, taking time and labor, and then perhaps you will be disappointed in some of the trees.

It's a mistake to plow an orchard that stands on this upland here, as the roots run very near the surface, never going as deep as they would on rich, deep bottom ground, and always reaching out as far as the limbs of the tree, or further. It would be better to harrow with a sharp-tooth harrow, and then manure the trees, and be content with the crop of apples, and not strive to get two crops off the same land in one season, thereby taking nourishment that the trees need to perfect their fruit.

As apples need potash to give them a high color and a smooth, glossy appearance, there is no better way than to apply ashes on the ground. I have been told that ashes would kill a fruit tree, and I put half a bushel around a large tree that was bearing fruit, and in the fall when I took the ashes back to look for borers, I found thousands of fine, thread-like roots coming out from the bark of the tree, showing me very plainly that there was something in the ashes that was wanted by the tree, or those roots would never have been sent out by it; but it is not safe to apply ashes in the winter when the bark is frozen, as it will injure the trees; it never hurts them in spring or summer. Now, as I expect to continue to plant apple trees as long as I live on a farm, I come here expecting to learn some things that will keep me from making so many mistakes in the future, and thereby save much valuable time, as life is too short to make many mistakes in tree-planting.

WHAT I KNOW ABOUT GROWING AN ORCHARD ON WASTE PLACES.

[An address by HARRISON BOWMAN before the Farmers' Institute held at Lebanon by the Board of Agriculture of Missouri, 1891.]

Having about four acres of waste land, that puzzled me what use to make of it, it was too stony to even try to plow it, and covered with all kinds of brush and some trees, I did not want it in that state of nature for two reasons: First, it was no profit; second, it hurt the looks of my farm. So the idea struck me that I would improve the looks of the unsightly ridge; I would clear it off and get clover to grow on it, but what good would clover do when it was too stony to even think of mowing it with the scythe; so I balked on the clover part. Well, I will plant it in apple orchard. All right. So I went ahead with my orchard project; first, to get the holes dug was the next obstacle, so with pick, shovel and crow-bar, we dug the holes for the apple-trees (I use the word we because my boys helped me). We dug holes the best we could. It was a stony job, I tell you. The planting would have been easy enough if there had been dirt to fill in around the trees and fill up the holes, for all we took out was more stone than dirt. So we had to do a great deal of borrowing dirt, but we planted the four acres, all the same, in Ben Davis apple trees.

After planting we hauled straw that had been tramped under foot by the stock (this was in the spring) and put it around the trees; it answered as a mulcher and manure. I just put it around the trees about three or four inches thick and two feet around. The summer was a dry one, but the trees grew right along, contrary to what my neighbors predicted, that they would die in August. There was not one tree died, and there is none dead yet, and that has been five years ago. In the fall we cultivated around the trees with pick and mattock; the straw had killed the grass and made the soil loose and mellow. Remember, we had to sprout and keep the sprouts down; so every spring we hauled more straw and put around the trees, still getting farther away from the tree; so by this time we are half way with our work of covering the ground. The trees grow faster, look thriftier, bear better and have nicer apples than any young orchard in the district. I am also growing an orchard on smooth land, with the same care and attention as the stony one, but the stony one seems to be taking the lead so far, and I think from my experience in the two kinds of land in orcharding, that the stony land is just the kind for Ben Davis apple-trees. This much I do know, that where I had a waste four acres, I have a nice, thrifty young orchard.

All this I can substantiate by members of this society, if need be. There is no need for the poor family to do without fruit when you can get land (waste land) so cheap.

ORCHARDING ON THE OZARKS.

[A paper by J. B. ATCHELEY, read at the Laclede county Farmers' Institute.]

To get a good orchard, it is necessary that the land be thoroughly plowed and harrowed until level. The best way to lay off the rows, and get them as straight as possible, is to use a steady double team and large single-shovel plow. Lay off the land both ways, 22½ to 30 feet apart, according to the strength of the land and the condition of the subsoil—the stronger the land and the deeper the clay, the wider the rows. Set the trees in the cross or check.

Second—Taking all things into consideration, I prefer two-year-old trees for planting. Always go to the nursery and get the trees fresh from the field, if possible, as trees that are "heeled in" are apt to be damaged by roots drying, freezing, or any improper handling of any kind. Buy them direct from the proprietor himself, with his assurance that they are true to name.

In my experience, I set 500 trees direct from the nursery without shaking the dirt from the roots, and, as a result, I find that they grew and stood the drouth much better than those that were shaken, with the best of care. I do not believe that an over-grown tree is good, but I prefer a well-formed tree with stout stock, and limbs at right angle with the stock; no acute angles or perfect forks.

Third—Trees should be set very little deeper than they were in the nursery, but not, as did some of my neighbors, 18 inches deep. The trees will live all right, but it takes one year for them to put out roots or form roots near the top of the ground where the soil is warm. Two-year-old trees should be set 10 or 12 inches deep.

The hole should be fresh—not dug long enough before setting to allow the dirt to become stale and the bank dry and baked, but be fresh. Place the tree in the hole and line the body direct with these furrows both ways, at the bottom; lean the tree to the southwest, and place the soil portion of the dirt at the bottom, in contact with the roots.

In setting some of my trees I drew some rich soil from the valley and placed in the bottom and around the tree, and these grew and did better than those that were set in the common soil. I also drew some chip manure and placed at the bottom of some of the same setting, and that proved to be of too dry a nature, and the trees suffered for moisture during hot summer.

Fourth— Cultivating an orchard is one of the most important features to be considered. An orchard, to be successful, must be cultivated. The land should be plowed with a double team, so as to throw the dirt from the trees and to the middle of the rows; by so doing you will avoid the evil of having each tree on a little hill that will serve as a drain, so that in hot weather, if you have a shower of rain, this will run the water away to the middle of the row, where the little tree cannot reach it. But by plowing the dirt from the tree you have it in a little depression, and by this way you avoid the high dry mound that serves as a home for mice, moles, gophers and hares, and every shower runs more or less water to the tree, and as you cultivate the dirt works back to the tree and will be ready to throw away in the spring, thus keeping the tree in the lowest ground in the field.

I believe corn to be the best crop that can be planted in an orchard, because the cultivation is deep and perfect, and the corn furnishes the necessary shade in the heat of the summer. My experience teaches me to never sow small grain or grass of any kind in an orchard.

Meadow allows the land to top-drain where it lies rolling, clover not excepted. Meadow allows the land to lie too long, and the fruit roots lie in contact with stale soil; while if the land is cultivated and the feed roots broken, the young fruit roots come in contact with new soil and a new supply of nourishment is furnished to the tree.

Fifth—Pruning is a subject that is entertaining the minds of thousands of orchard men of to-day. Time, manner and extent each claim their share of attention. There are two classes of pruning: one from around the base of the tree, the other from the top. The first may be done any time when you have your knife sharp. The other ought to be done just before the sap rises in the spring, so that the stumps or knots will have but little time to dry or season before the reparative process sets in. No orchard should ever be heavily pruned in any one season. Moderate pruning will do but little harm to old and neglected orchards, with thorough cultivation, while it only stimulates a vigorous growth in a well-cared-for orchard. One of the great secrets of pruning is to start but a few limbs when the trees are small, and ever after there will be nothing but small cross limbs, with an occasional acute fork to cut. As trees grow old the top must be kept open, in order to give plenty of sunlight to the fruit to produce flavor and appearance.

Sixth—The kind of land best adapted to apple orchards in this part of the country is a kind of yellow gravelly clay, with hard-pan deep or wanting. Our hickory, black-jack and post-oak land that lies comparatively level, is the best land for an apple orchard that I know anything about, although any of our uplands on which the hard-pan is not too near the surface, will bring good fruit trees and fine fruit. For size, flavor and appearance, the Ozark plateau stands at the head of the list.

HOW TO PREVENT APPLE SCAB.

[B. T. GALLOWAY in the Rural World.]

Apple scab can now be prevented so easily and cheaply that there is no longer any excuse for the injury it occasions. We first successfully treated this disease three years ago, and since that time our methods of work have been considerably improved. Briefly, the treatment we would now recommend is as follows:

When the fruit is about the size of a pea, spray the trees thoroughly with a solution made by dissolving five ounces of carbonate of copper in one and one-half pints of aqua ammonia having a strength of 26°. The copper may be dissolved in an ordinary water pail. When completely dissolved, pour the liquid into a barrel, and then fill the latter with water. A barrel of the solution made in this way will cost about thirty-five cents, and will be sufficient to treat fifteen large trees once. Make a second spraying twelve or fifteen days after the first, and the third two weeks later. If an ordinary season, three sprayings will be sufficient; but if rainy it will be necessary to make one or two more. In applying the solution, it is of the highest importance that the leaves and fruit be thoroughly covered, and this is only made possible by using a good strong force-pump, provided with a suitable spraying-nozzle. Such a machine need not cost over twelve or fifteen dollars, and where one has a larger orchard, this amount will be easily saved in a short time.

The carbonate of copper is sold at retail for forty to seventy-five cents a pound. It can be made at home, however, much cheaper—the usual method of preparing it being as follows:

Dissolve three pounds of sulphate of copper or blue-stone in five or six gallons of hot water. In another vessel dissolve three and one-half pounds of sal soda in six gallons of hot water. When cool, pour the soda solution into the copper liquid, stirring constantly the while. Allow the solution to stand twenty-four hours, then siphon or pour off the clear liquid, taking care not to disturb the sediment any more than is necessary. After the clear liquid has been removed, add water and stir up the sediment. Let the liquid stand another day, then draw off the clear liquid again. The sediment, which is carbonate of copper, may then be dried and used as already described.

Washington, D. C.

AMERICAN FORESTRY ASSOCIATION.

This Association endeavors to promote:

1. A more rational and conservative treatment of the forest resources of this continent.

2. The extension of forest growth wherever for climatic or other reasons such seems desirable.

The Association does not desire to prevent the legitimate use of the forest growth, but recognizes the same as a crop to be utilized, and judiciously managed.

The Association does not, therefore, antagonize the lumberman's or timber-land owner's interests, but on the contrary endeavors to perpetuate, improve and increase the productiveness of his property, discountenancing only wasteful practices, which decrease its value and are injurious to his own and public interests.

The Association invites owners of timber and wood lands especially to join its ranks for their own benefit.

The reason and necessity for the existence of this Association arise from two general considerations.

On the one hand, we consider that a constant and sufficient supply of home-grown wood material is desirable in the household of a nation.

That the forest-cover on mountain slopes and hillsides bears an important relation to even waterflow and favorable soil conditions.

That in certain locations climatic conditions are ameliorated by timber belts.

That a proper regulation of the soil to the uses to which it is best adapted must be the aim of national economy, making it desirable to cover waste places and non-agricultural lands with forest growth; and finally,

That fire not only damages the present condition, but endangers the future of the forest.

On the other hand, the following facts are well established with reference to our own forest resources:

That the present reported forest area of the country (less than 500,000,000 acres) cannot, in its present condition, and under present methods of utilization, furnish a continuous supply of wood of all kinds even to our present population of 65,000,000, the annual consumption being over 20,000,000,000 cubic feet.

That the supply of building material, if slaughtered in the same manner as heretofore, without regard to recuperation, will be practically exhausted before any new crop now started can be ready for use.

That our supplies will be inferior in quality and inferior in amount per acre, if left to nature's methods of reforestation after the forcible interference by man, while an increased population will make larger demands on these resources.

That in spite of the employment of substitutes, the consumption of wood is increasing with the increase of population all over the world.

That the utilization of the virgin supplies is now generally carried on in a wasteful and improvident manner, preventing rather than encouraging desirable reproduction.

That fire in our country destroys more valuable material than is legitimately used, and does untold damage to soil and growth.

That by devastation and destruction of the forest cover on mountain slopes and at the headwaters of streams, the regular water-flow has been disturbed in many localities, giving rise to alternating excessively low and high-water stages, failing of springs, washing of soil and aggravated flood dangers.

That large areas of our country are valuable only under a proper system of irrigation, which, in turn, depends upon forest conditions on the mountain slopes.

That large areas of our country now destitute of forests need to be forested to make them permanently habitable and fruitful.

That by unwise deforestation many waste places have been created, which are a blot on our fair domain.

That the tendency of our people in general is to squander resources, and to give but little thought to the consequences of this squandering upon the future welfare of our country; hence, timely reform is more urgent.

Upon these premises we base our right and duty to associate all who recognize the same conditions and are patriotic enough to exert their influence in bringing about a change.

Our efforts are to popularize an interest in forestry questions and to spread a knowledge of forestry principles by means of meetings, public discussions, distribution of literature, and by influencing legislation in aid of the forestry interests of the country.

And more especially are our efforts directed at present to accomplish the following definite results:

To have the National Government protect and administer properly the remaining timber lands of the public domain. These lands, less than seventy million acres, are situated mainly on the western mountain slopes, where, by its position, the forest is of paramount value to the adjacent country. At present, for lack of proper protection, more timber is burned than used, and for lack of proper methods in supplying the needs of the resident population, many millions of dollars worth is stolen, and in such a manner as to preclude natural reforestation. The Association has prepared a bill for the establishment of a proper forest administration.

To have the individual states create for their respective localities forest commissions or commissioners to acquire a proper knowledge of the extent and value of their forest resources as a basis for forest legislation, and to enforce such legislasion.

To have Arbor days established in all states as a means of educating the people in the forestry problem, and of fostering a tendency to build up instead of destroying tree growth.

To increase our membership and influence for the accomplishment of the objects herein set forth.

The present status of the forestry movement in these particular directions can be briefly stated as follows:

1. The President of the United States has been authorized by the law of March 3, 1891, to "set apart and reserve from time to time, public lands wholly or in part covered with timber or undergrowth, whether of commercial value or not, as public reservations."

We want definite information regarding locations, the reservation of which we may recommend to the President.

2. By the same law the unrestricted cutting of timber from the public domain is permitted by "a resident, for agricultural, mining, manufacturing or domestic purposes," to be used within the state or territory; "provided, that the Secretary of the Interior may make suitable rules and regulations to carry out the provisions of this section."

We want the aid of all in urging upon the Secretary the establishment of regulations to counteract such free use of the public domain as will devastate the forest-growth, before a proper administration can be inaugurated.

3. The Association advocates the passage of a bill (S. 1779 of the 50th Congress) by which the public timber-lands are placed under such administration as will satisfy local demands for wood supplies without decreasing the value of forest cover on the mountains.

We want the provisions of this bill studied and every influence used to effect its passage.

4. The Timber Culture act, by which forest planting in the treeless prairies and plains was to be fostered, has been abolished by the law of March 3, 1891, without any substitute to the same end.

We would advocate that the States themselves encourage such planting by suitable aid and legislation.

5. The following States have established Forest Commissions of varying character in their functions: Maine, New Hampshire, New York, Ohio, Kansas, Colorado, California; while Vermont, Pennsylvania and Michigan have had temporary commissions.

The State of New York is moving toward the establishment of a forest reserve and forest administration in the Adirondacks, and the Adirondack League club is the first private corporation to inaugurate forest management on its property.

The following States have State Forestry Associations: New York, Pennsylvania, Ohio, Kentucky, Colorado and Minnesota.

6. Arbor day has been established in the following States:

By law: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Maryland, Georgia, Texas, Wisconsin, Ohio, Illinois, Kentucky, Nebraska, Montana, Wyoming, Colorado, Idaho, Nevada and Oregon.

By Governors: Vermont, Kansas, New Mexico, Florida and Michigan.

By School Superintendents and other agencies: Alabama, Minnesota, Indiana, West Virginia, Missouri, Iowa, Dakota and California.

7. The American Forestry Association has been in existence since 1882, and has members now in 34 States. Its official organ is "Forest Leaves," a neat and instructive monthly publication, edited by the Pennsylvania Forestry Association. This is sent to members free of charge.

Secretary's Office, Washington, D. C.

MISSOURI COUNTIES.

[By request from this office, editors of a number of the local papers of the State prepared the following articles descriptive of their respective counties.]

MEXICO AND AUDRAIN COUNTY.

What has heretofore appeared in the Ledger concerning Audrain county has created demand for information regarding its present condition, and to meet that requirement, we have compiled the following statement of its natural and acquired advantages and resources, which will be used also in the annual report of the State Board of Agriculture.

Audrain county, as everyone familiar with the State of Missouri knows, lies on the divide betweeen the Missouri and the Mississippi rivers, and adjoins Ralls and Monroe counties on the north, Callaway and Montgomery on the south, Pike on the east, and Boone and Randolph on the West. Its greatest length is forty-seven and widest breadth nineteen miles. It embraces six hundred and ninety sections, or four hundred and thirty-six thousand four hundred and eighty acres. It is intersected and watered from south to north by Salt river and its numerous tributaries, skirted with fine timber and fire-wood, and from north to south by Cedar, Seven Mile and Loutre and their tributaries, and from west to east by Cuivre and its adjuncts, Hickory and Sanders, similarly wooded. It is centrally situated on the highest elevation of that zone which traverses the American continent between the thirty-fifth and fortieth parallels of north latitude, and is noted for the longevity and vigor of its men and animals, and lies on the most direct route of railroad communication, travel and traffic between the eastern and western and northern and southern portions of the Union. Two railways, the Chicago & Alton and the Wabash, intersect one another at Mexico, its county seat, the one connecting that place with the Atlantic and Lake cities on the east, and Kansas City, Denver and San Francisco on the west, and the other stretching out to St. Paul on the north, and to New Orleans and Galveston via St. Louis on the south, thereby furnishing its merchants, mechanics, manufacturers and agriculturists rapid transit to the best markets of the country.

With an altitude of about eight hundred feet above the ocean, Audrain county is freer of malarial and lung diseases than lower districts. Neither its winters nor summers are of extreme duration, but are shortened by delightful and temperate springs and autumns. Its snows are light and transient, and its heated terms, of which there are usually two of about a fortnight's duration, are modified by pleasant prairie breezes. Its annual rain-falls are from thirty to forty inches, and its surface, gently rolling, is drained by deep-bedded streams that carry all surplus water rapidly away. Its soil is rich and deep, of easy culture and admirably adapted to the production of all the grains, cereals, grasses, fruits, vegetables and flowers that are usually cultivated in its latitude. Its subsoil of strong clays and marl abounds in lime, organic matter and other productive constituents that, with careful cultivation, will require centuries to exhaust. Thus far the soils of most of its farms have improved with tillage and pasturage. It is only those of a small number that have been impaired by neglectful and exhaustive management. Nearly three-fourths of the county is prairie and almost its entire expanse is available for agricultural purposes. Indeed, the whole county is now made to contribute to its productions, through cultivation or pasturage; but most of its farms are too large, and can, therefore, be divided and converted into small ones with great advantage to both old settlers and new comers. Already there has been some progress in this direction, as is evidenced by the new dwellings, barns and fences that have been recently erected. But much in this line remains to be done before the agricultural resources of the county can be developed to their utmost.

The present agricultural products of the county are corn, wheat, oats, barley, hay, tobacco, sorghum, linseed, potatoes, vegetables and fruits, with horses, jacks and jennets, mules, cattle, sheep and swine. The prairie grass has entirely disappeared. Everywhere it has given place to blue-grass, which grows as luxuriantly as in far-famed Old Kentuck. Mixed with timothy and clover, it makes excellent hay, and furnishes the most desirable of late and early pasturage. At present the county is well supplied with corn and hay, which, notwithstanding the drouth of this season shortening this year's yield, are more remunerative than usual on account of enhanced prices. At the same time, through unusually large shipments the number of live stock on hand is somewhat reduced, and yet at current rates they are worth over three millions of dollars, although for taxable purposes they have been assessed at much less. The present population of Audrain county is a little over twenty-two thousand. Of these, at least seven thousand five hundred reside in its towns. This leaves but fourteen thousand five hundred, including women and children, for agriculture, or about twenty-one to the square mile, or not more than one family on the average to the quarter-section, when there might be one to every eighty acres with great advantage. The prominent minerals of this county are coal and fire-clay. They are found in conjunction about seventy feet below the tops of most of the ridges in the county, and especially in those extending along the route of the Chicago & Alton railroad from Mexico to Vandalia. The coal is thirty inches thick and is extensively mined at Vandalia and other places. The fire-clay underlies this bed of coal, and is the best of which we have knowledge. Its bed varies from twelve to sixteen feet in thickness. This clay is extensively manufactured at Mexico and Vandalia into fire-brick, piping, tiling and engine, stone furnaces and fire-place linings. Besides there are several potteries making ware and flower-pots out of it. Over a hundred thousand dollars are employed in this business, which as yet is in its infancy. A million or two dollars might be safely and profitable devoted to the manufacture and exportation of this inexhaustible fire clay, and not until this is done and every eighty acres shall have its family, will the resources of Audrain county be in a fair way to be fully developed. All this creates a wide opening for the would-be prosperous. Nowhere can greater inducements to emigrants be found.

The present value of the real and personal property of Audrain county is about fifteen millions of dollars. This includes seventy-eight miles of railroads, constructed at a cost of about two millions of dollars. This county is out of debt, and its taxes less than the constitutional limit.

The schools of Audrain county are of high order. This is especially true of Hardin college and the Fleet Military academy at Mexico. These, as well as the high school, prepare scholars for the State University. Many families have moved to Mexico on account of its superior educational advantages, and we hear constantly of others desiring to do so. But the public schools are the crowning glory of Audrain's institutions, and constitute, with its newspapers, the main source from which the great body of the children of its agriculturists derive their literary preparation to prosecute the calling of their fathers or enter successfully those of the professions. They embrace all classes, furnish a standard of knowledge for the rising generation, and turn out as many boys and girls fitted for usefulness as do institutions of higher pretension. Indeed, it is not uncommon for country lads to outstrip collegiate and university students in the race of life. The county is divided into ninety-six school districts, with 7,148 scholars between the ages of six and twenty years, 140 teachers, and an annual school fund of $64,232.64, a sum somewhat above its educational necessities.

From its settlement the population of Audrain county has been noted for its morality, consequently numerous representative families and churches of all denominations exist within its bounds. The Baptists have 1,600 members and 14 churches; the Christians 1,500 communicants and 11 churches; the Methodists number 650 with 6 churches; the Presbyterians 500 with 6 churches; the Episcopalians 50 with 1 church, and the Lutherans 100 with 2 churches, making a total of 4,400 communicants and 40 churches, at which there is a Sabbath-school attendance of 5,479 children. In addition to these there is a large Catholic congregation at whose numbers we have no means of arriving. Connected with these churches are the usual associations and societies of temperance, missions, charity and Christian Endeavor. As a body the churches of Audrain are aggressive; their hold on society is tenacious and their influence highly beneficial. Not unfrequently the spirit of christianity shines most brightly among populations of moderate means, but it cannot be said that the Christians of Audrain county have lost any part of their zeal in their advancing and more prosperous financial and social condition.

The various towns of Audrain county are well supplied with merchants and dealers of every description, and there is no difficulty in obtaining from them, at reasonable rates, both the necessaries and luxuries of life. They are deficient, however, in manufactories, and though admirably situated for such enterprises, and willing to assist in their establishment, have not as yet been successful in attracting them.

A sketch of Audrain county would be incomplete without mention of the annual fair of its county seat. The modern exposition has absorbed the exhibition of mechanism, art and manufactories, and left for ordinary fairs little beyond live-stock and farm products, to which latter the Agricultural Association of Audrain county has mainly confined its premiums. These however have been of more than ordinary liberality, and have enabled parties to bring fine stock from a distance to compete with local production. One effect of this has been the introduction and breeding of the very highest grade of animals. Another is that the exhibition has attained a reputation and patronage scarcely second to any other. The Association has a capital of $20,000 and owns handsomely improved fair grounds a short distance south of Mexico. This year its premiums amounted to $10,000, $7,525 of which were awarded to the successful competitors of its speed rings.—*Mexico* (*Mo.*) *Ledger.*

BUTLER COUNTY.

[By Dr. J. C. McCowan, Poplar Bluff, Mo., in State Horticultural Society Report.]

Truth is mighty and will prevail. Emanating as it does from the throne of Almighty power, it is an omnipotent foil before which error will always fall.

Butler county is a broad subject, and happily is just now beginning to brighten with the burnished truth of her fruitful fields of productive soil. But much the more as the boundless exaggeration of its deadly miasm which diffused with the winds of heaven the seeds of every malady which has a name in our language, is dispelled with the published truth of the comparative healthfulness of the climate.

Butler has become innocently famed in other parts of the State as the abode of every amphibious animal and deadly reptile, as well as the favorite home of unsparing pestilence.

Butler county, in respect of the native wealth of its soil, is scarcely surpassed in Missouri, and as to the value of the incumbent timber, stands unrivaled throughout our great commonwealth. Of our salubrious climate, it will suffice to say that in general healthfulness it is not excelled by any of the more favored counties of the higher latitudes in the State.

Butler county, in short, may be described, as every other county in the State with very few exceptions, as good, bad and indifferent.

But the stranger, passing over our territory with only a profile perspective, can get but a false impression, which a general view alone may correct.

We have here elevated plateaus of gently undulating table-land, which unfold many charms to the enraptured vision of the practical farmer or ranchman.

It is not in profile, but in periscopic view, our county must be seen to be fully appreciated. It has its rough side, but the law of compensations, which never fails in the distribution of the benefits of nature, covers it with a charming verdure, which entices to the absolute abandon which always prevails where the provision for the support of animal life is without limit.

This rough side, as it is presented from the plastic hand of nature, is suggestive of the irresistible internal forces which in periods of volcanic upheaval have lifted to the surface not only acres but miles of stone. This feature, without investigation, would condemn all this portion of our territory to the hopeless condition of an absolute desert waste. But what a mistake. The closest rock-ribbed hill there is in all this boundary, in the lofty forest of sturdy oak, together with the almost unbroken carpet of luxuriant grass, consisting not only of nutritious grass, but a profuse growth of provine in all the untamed varieties, forever forbid the conclusion of a sterile waste. In the midst of our best cultivated districts in the most advanced counties , there is no other comparison but the cultured clover field.

But to show up the country in terms of easy comprehension, we would head the procession in the march of progress in our great State with Saline county in the van in the honorable avocation of agriculture. Accepting her annual products per acre as the standard of comparison, Chariton, Carroll and Platte stand second in the rank in their claim of the laurel wreath.

But Butler county, in some of its parts, with similar features of surface soil, with a distinctive forest growth of timber as contrasted with the dwarfed growth of Platte, produces with singular uniformity fifty bushels of corn and one and a half to two tons per acre of timothy or herd grass.

In testimony will introduce one man's experience through a period of eighteen years. He is not of the questionable sort as to veracity.

Fifty measured bushels of corn was his ordinary crop—never less, but often overrunning that measure. We will keep the same witness on the stand as to the hay sold last year from ten measured acres of grass. At $16 per ton he netted the not undesirable sum of $340 on the crop.

Sustained with necessary energy, the intelligent tillage of the soil would prove invariably profitable here to every man engaged in this honorable calling.

As we do not wish to be tedious, we will vary the aspect of the subject by considering briefly the adaptation of the county to the valuable grasses. Here is the stockman's home par excellence. Run an extended line of comparison from the extreme northwest of Washington territory, dropping down to the lower latitudes in a southeasterly direction through Oregon, Idaho, Dakota and Wyoming to Colorado, not forgetting to pay our passing compliment to Nebraska and Kansas, we will journey on through the Indian territory into northwest Texas, where the ranchman holds undisputed sway.

Right here in Butler we find everything thrown together with a rich profusion nowhere else to be met with from nature's bountiful hand—every material element conducive to the wealth of the stockman: a beneficent climate, pure water beyond exhaustion from hill and valley, and a great variety of nutritious grasses, supplemented by uncounted toothsome plants, rich in nitrogenous and carbonaceous properties united liberally with the phosphate of lime to induce the rapid production of bone and muscle and the steady accumulation of fat.

As to the question of the variety of our native grasses, it is not necessary to invite the attention of such as have had practial experience of their value.

From the northwest all the way down south to the westward of the 100th meridian there is no other grass of special merit but the buffalo grass. Eastward of that meridian, in Nebraska and Kansas, the list soon begins to increase in variety. From that latitude south we are greeted with the more valuable of the prairie grasses, including the far-famed blue-stem, or broad-blade, the best fattening grass there is—the greatest boon given to man where nature has so lavishly scattered her treasures of wealth.

But after so swift and extended flight upon the wings of thought, occupying but a few minutes of time, accomplishing hundreds of miles in distance, we will fold her pinions and settle down at home to contemplate the prospect around us.

Butler county has more miles of unfenced grass, a greater variety and better grass, in more luxuriant growth, than any other county in the State. Besides that, this wide expanse of unkempt pasture land is subdivided by the season into summer and winter range.

After the sun returns to this part of the world from his long annual journey across the middle line, and with the warm beams of his smiling face loosens the icy bonds of winter, wooing vegetation back to life and luxuriance again, the forest soon takes on full leaf and covers with its arborescent shadows the face of the earth, which invites not in vain to its balmy protection against the fierce rays of the noonday sun after the summer solstice comes. After these life-giving influences are responded to in a full growth of grass, and the many plants which delight in the munificent soil of this part of the earth, cattle and sheep find here indeed a most felicitous home.

As to the number of valuable grasses here to be found, no one but a thorough botanist can answer. In Kansas it is claimed they count one hundred and more different varieties. No doubt, including with our numerous kinds all the nutritious plants which our sheep and cattle find profitable, the list may be indefinitely extended. All the teeming millions of wealth now going to waste may in time be utilized and carried to market in the carcass of the fat bullock and mutton.

This rich pasture is to be had here all the year round, by shifting to the low ground during the winter, without the loss or the knowledge of any of the conditions previously enumerated—grass, water or shelter.

The immense advantage of distance afforded by our proximity to market over other points more remote, is in itself worth millions to this part of the country.

I shall not in this place speak of syndicates in connection with the demand for beef in the great markets of the States, further than to remark, there is an impression in some quarters of a tendency to disintegration. This tendency may contribute materially to the promotion of the growth of the best breeds for the butcher's block, in conjunction with the system of mixed husbandry now generally prevalent in the land.

Finally, there is no tenable reason known why our capital town, with a little effort and a small outlay of money, may not become the nucleus of an extensive creamery. Here an adopted home for all the best milk breeds can be had at less cost than anywhere else in all the broad expanse of the States, with every comfort in abundance to create the very elysium of animal life.

If the Almighty Creator of man, his constant benefactor and best friend, has ever contemplated the provision on the part of man of an earthly paradise for the cow and her progeny, it can be obtained here.

REPORT ON THE LANDS OF BUTLER COUNTY.

MR. CHAIRMAN: The subject now presented is new in our consideration, but its novelty does not withhold anything from its value. The extent of our forests of post-oak, or of our so-called crawfish land in the valleys which form so large a feature in the surface appearance of the county, is not definitely known; but the amount of either does not particularly concern us now, but the productive quality is the subject of special consideration at present. In the hill land of the county, post-oak, in larger or smaller forests, witnesses the existence of a peculiar soil in nearly every measured section. Perhaps in the more elevated plateau it is there predominant. As to the soil, it is in heavier or lighter strata, but always intensely active in its power of productiveness. As a consequence, under severe tillage from year to year, it might the more readily exhaust or fall into a non-productive state; but here, as in the general management of farm operations, the wakeful skill of the farmer is called to the rescue. At this point our further discussion of the subject should be prefaced with the inquiry as to its peculiar adaptation. It does not lie in the circumference of the cereals, but in that of the valuable grasses—not of the meadow varieties, but such as enter into the active support of pastoral life, yielding always up to its full capacity in quantity and of unequal quality; with its ready assimilation of all animal and vegetable fertilizers, as the home of cattle and sheep at large; its susceptibility of an increased productiveness is unsurpassed and without end. Here and there, in my limited knowledge of the country, are some wide districts of this particular timber always grown from a singularly characterized soil in this, that its native grasses of whatever variety are of the finest texture and replete with such nutritive power as is rapidly and profitably appropriated to the full in laying on of flesh, the sweetest and most savory of its kind, whether beef or mutton, found in the shambles of our city market. In these particular localities could be founded the finest sheep walks, greeted by the cheering smiles of Heaven's bright sun, rewarded with the highest possible profit obtained from that honorable pursuit. So used, old Father Time himself will not live beyond the end of the increased fertility of that class of our soil.

But of our crawfish land, let us submit and reflect some facts pertaining to its essential nature, consisting as it does of calcareous lime, blended sparsely with sand, but liberally with vegetable and animal matter in every stage of decay. It is productive beyond the ken of the inexpeaienced farmer, of all the vegetable grains and grasses successfully grown in our latitude. Like that of the post-oak, the soil has not an unlimited adaptation, but in the production of corn is only second to our best dry loam of the valleys, and in the growth of valuable meadow grass, herds-grass and timothy is without a rival. In the production of these two most valuable grasses, transported in a dry state to meet the demand of the city market, this soil is without a peer in the whole realm of nature.

The world's laboratory, of which light, air and water are ever sleepless agents, constantly active in replacing the constituents withdrawn from the soil in support of the husbandman's crops—to himself and the world the everlasting source of both food and raiment. Nature has not in any quarter of the earth been so lavish in the creation of soil as to place it beyond the reach of exhaustion, not even in the world wide famed valley of the Nile, for the soil there in each returning year is repaid for last year's loss by the heavy soil drift which comes down with the annual overflow of the river Nile from the mountains of Nubia and Abyssinia. But the universal law of compensation is always in full force. Our crawfish land is not an exception to its beneficent operations. The air we breathe by its action of evolving gaseous vapors from the animal and vegetable debris in the soil reacting on the lime contained will keep up for a period but not forever its active capabilities. Hence the demand, to counteract the exhaustion, of the liberal supply of fertilizing agents in the form of carbonates, phosphates and nitrates to liberate the latent elements contained in the earth, to bring them into an active and available state for the continued and possibly the increased growth of valuable vegetable production.

From the views here presented it would seem almost unnecessary to repeat in precise terms that the soil now under consideration is not prolific in valuable production, until after acknowledging the reactionary force of such life-giving principles as convert its dormant properties into a productive plant-bed. It will so continue during a period of exposure to their vitalizing influence. But later on, when signs of partial exhaustion are made manifest, it can be successfully renewed by the provident intervention of man, with the full assurance that love's labor is not lost, but that he shall receive in full measure the merited reward of his labor.

GENTRY COUNTY.

Northwest Missouri, as the term indicates, lies in that part of the State between Iowa on the north and Kansas and Nebraska on the west; the great bend in the Missouri causes that river to form the southern boundary, while the east fork and main stream of Grand river are its eastern limit.

Its territory comprises the historically famous Platte purchase, and the more recently almost equally celebrated Grand river country, together embracing an area of nearly 10,000 square miles of the choicest land in that richest of all countries, the Missouri valley. Of this country no part has been more bountifully provided for by nature than Gentry county with its rich soil, abundant timber of the choicest kinds, and water in its streams and springs and everywhere beneath its surface within easy reach of wells.

This county is bounded on the west by Nodaway, on the east by Harrison, on the south by DeKalb, and on the north by Worth counties; is only twelve miles south from the Iowa line, thirty miles northeast of St. Joseph, and sixty miles north of Kansas City, and is at the center of the richest corn, cattle and hog-producing country in the United States The county has an area of 322,880 acres, all available for farming purposes and nearly all susceptible of cultivation. There is no waste land in the county.

The population of the county is over 20,000, and is composed of as thrifty, orderly, quiet and law-abiding set of people as live in the older States.

The face of the country is undulating, sufficiently so to afford good natural drainage, and is divided up into beautiful prairies, lying between the three forks of Grand river, which traverse the county a few miles distant from each other, bordering the prairies with belts of oak, walnut and other timber valuable for farming purposes, while the prairies are dotted over in every direction with groves of timber, which seem to have been designed by nature to adorn the home of the settler and to afford shelter for his domestic animals. The river bottoms are wide and high, generally above overflow, and the county is especially favored with a large proportion of this class of the most valuable of farming land.

The soil is dark alluvial, of a surprising depth even on the highest prairies, as is everywhere amply shown by the luxuriant growth of their crops of corn, wheat and grass, and the river bottoms differ in this respect from the prairies only in the soil being of an unnecessarily greater depth; the subsoil is wonderfully capable of withstanding both drouth and excess of moisture equally well; in the latter case it absorbs water like a sponge, and retains a sufficiency to withstand all demands that may be made on it during a spell of dry weather.

The climate is mild and healthful. There are no swamps nor wet lands, hence no miasma. The air is dry and bracing, particularly during winter, hence is especially favorably to weak-lunged people. The winters are short, and with but little rain or snow-fall, the changes are not as sudden nor is the weather as cold as in the eastern states and those further north. Spring comes early, affording a longer season for planting crops and other work. The summers have but few uncomfortably hot days, while the nights are always cool and pleasant; but the long, mild delightful autumn is the most charming season of this country. It is almost invariably dry, and just cool enough for comfort until late in December, and is by far the most delightful season of the year.

The piercing winds which sweep the prairie countries west and north of us, and are the most disagreeable feature of life beyond the Missouri river, are almost unknown here, while the hot, scorching winds of the Kansas summer are entire strangers to us in Missouri—the many timber belts and groves before alluded to being our safeguards against them all.

Timber is abundant, and well distributed all over the county. Native timber is worth from $1 to $1.50 per hundred, and cord-wood from $2 to $3 delivered at the door.

Coal, though not well developed, owing to the abundance of timber, certainly underlies the county at no great depth, as every indication exists, and the best authorities agree as to its presence.

Water is as abundant and well distributed as the timber; the streams of Grand river and their numerous tributaries afford stock-water in all parts of the county, and springs are numerous all over the country. No trouble is experienced in finding water in wells sunk to a depth of fifteen to thirty-five feet.

Rock of the choicest quality for building and other purposes is well distributed throughout the county, and brick clay is abundant.

All the products of this latitude are a success here. It is a grand corn country, and from 1,500,000 to 3,000,000 bushels are annually grown, the yield ranging from 30 to 90 bushels per acre. Wheat is an excellent crop, especially in the oak and hickory timber soils, where 15 to 35 bushels per acre are raised by good farmers with as much certainty as in Nebraska or Minnesota. Oats are generally a heavy crop, giving 30 to 60 bushels per acre. Rye is an unqualified success, and also barley, buckwheat and flax, but the grasses are the pride of Gentry county. If any country can surpass ours, it has not yet been found. Timothy, clover and blue-grass grow in the greatest luxuriance, and have been and are the foundation of our wealth, making this the finest and most prosperous stock country of the West.

The fruit interest prospers here as everywhere in North Missouri. Fine, thrifty, fruitful orchards, vineyards and small fruits attest the success of this noble industry in every neighborhood, and the production of apples, pears, cherries, peaches, grapes and smaller garden fruits of the highest quality might be carried to mammoth proportions; while the vast population which will soon occupy the Upper Missouri valley to the northwest of us beyond the fruit line, and to which we have the shortest possible line of railroad, will afford a market almost at our door without an equal in the West.

As a grazing country, Gentry county need acknowledge no superior in the world. It is a very paradise of the wild and domestic grasses. Many varieties of the wild prairie grasses still remain upon the native ranges, giving the most nutritious pasturage from April to December. Blue-grass fairly luxuriates in this deep, flexible soil, and is fast making the conquest of forest and prairie. Like white clover, it is indigenous to the country. The timothy and clover meadows are equal to the best in Ohio, Michigan or Illinois.

With a climate that admits of pasturage 260 days of the year, the finest grasses of the continent, the almost perfect shelter of the native timber, generous water supply, cheap lands, corn grown at a cost of 12 to 15 cents per bushel, thousands of acres of wild range, and no local disease to decimate the herds and flocks, no wonder that Gentry county makes a splendid live stock exhibit, and every man who sticks to the business becomes opulent.

Live-stock exports of the county now reach 30,000 swine, 10,000 cattle, 1,800 horses and mules, and about 8,000 sheep; which, at present figures, would aggregate the magnificent sum of $810,000; and yet not more than 25 per cent of the stock-growing resources of this rich county are developed. No legitimate business in the world approaches, in profit, the growing and feeding of cattle, sheep and swine in such a country as this.

Our railroad facilities are unsurpassed. The Chicago, Burlington & Quincy railroad runs through the county seat, Albany, and from nearly the northeast corner to the southwest corner of the county, giving direct and speedy communication with Chicago and the East, Des Moines and the North, St. Joseph, Kansas City and the great Southwest.

The Omaha & St. Louis railway, which connects with the great Wabash system, also passes through the center of our county, gives us a through line to Chicago and St. Louis on one hand, and to Council Bluffs and the Upper Missouri valley on the other. These two great railroads give us market facilities equal to any west of the great lakes.

We believe in schools and churches, and foster them liberally, both by statute and the higher law of public sentiment. There are eighty-nine public schools and school-houses in the county, an inalienable school fund of $35,000, which is being steadily increased by public fines and penalties, behind which is the State school fund of $10,000,000. There is not a county in the Old Bay State where the laws are more faithfully executed, or the people more law-observing, than here.

The Baptist church has a large membership in the county, with several congregations and preachers. The Methodists have several congregations and preachers; the Presbyterians and Reformers about the same. In fact nearly all the churches are represented in the county, including two or three settlements of Catholics with two churches.

We have no bonded debt, and with a valuation of nearly $5,000,000, and free from the burdensome taxation that has brought ruin to so many eastern and western municipalities.

Material progress and prosperity greet the visitor in every portion of the county. There are fine farm-houses and out-buildings; splendid farms and hundreds of miles of fine hedge and wire fencing; superior highways, substantial bridges, hundreds of orchards and vineyards, royal meadows, luxuriant blue-grass ranges and splendid herds of blooded stock in this fair and fertile country to attest the thrift and enterprise of the people. With all these evidences of wealth, prosperity and progress, the visitor is astonished at the low price of land.

The demoralization of land values in North Missouri is without parallel in the history of real estate transactions. Good wild and improved lands, under the most fortunate local conditions herein mentioned, are selling for less than the treeless plains 300 miles further west. The mania for homesteads west of the Missouri has carried past us the flood of immigration which has been coming west for the last few years, and with it many of the young men of North Missouri, who have gone to secure free lands at the cost of hardships attending a life on the frontier, leaving for those who prefer homes with all the surroundings of civilization and its comforts, the choicest of lands at their own price in Northwest Missouri immediately on the highways of the nation.

Ten to twenty dollars per acre will buy our choice unimproved lands, while improved farms can be had at from $12.50 to $30 per acre, and the choicest bargains await the new-comer who will stop from the mad rush to the far west to take advantage of what we have to offer.

Albany, the county seat of Gentry county, is situated on the east side of Grand river, in the midst of a region unsurpassed for grain and stock raising, and is supplied with first-class shipping facilities by two great railway systems, the C. B. & Q. and Wabash. A new court-house was built in 1885, a very fine building; and a brick and iron jail complete in all its appointments.

Stanberry, near the west line of the county, is a thriving young city of some 2,500 population, in a rich and prosperous country, and is the division of the Wabash railroad. It has a prosperous trade and an energetic set of business men who invite additions to their numbers.

King City, a new town in the southwest part of the county, is in the midst of one of the richest prairies in the west; a magnificent farming country.

Besides the above, the county is spotted over with other towns and villages: McFall, Darlington, Ford, Gentryville, McCurry, Evona, Alanthus, Ellington, Berlin, Island City, and several more; affording near facilities to our citizens for church-going, medical aid, trading, mail, blacksmithing, etc. But our Siloam medical Springs, at Gara, near the northwestern corner of the county, are the most remarkable object in Northwest Missouri. These springs, discovered by accident, only a few years ago, established first a local reputation for their wonderful medical properties, from which their celebrity has spread out wider and wider, until now patients flock to them from all parts of the West.

The property is in the hands of experienced gentlemen, and visitors will find no lack of comfort or attention while making a home at the sanitarium.

To immigrants we have only this to add: In drawing this picture of our county, we have endeavored to state nothing which the facts do not fully warrant, so that no one in coming among us can hereafter claim to have been deceived. We have to offer you new homes in a quiet and prosperous county, where labor meets a sure reward; where farming and all the trades and various business of life may be successfully carried on, and where prosperity is a certainty to those who faithfully seek it. We can offer you more fertile lands, a better climate, and less competition, than most of you leave in coming to the great West. We have been overlooked in the great rush westward, because we have had no giant railroad corporations with millions of acres of land to dispose of to spend hundreds of thousands of dollars in advertising us; but these facts are all working now to your advantage if you see fit to profit by them.

Manufactories of all kinds are needed here, and will afford a handsome profit to investors. The splendid hard woods of our county offer rare inducements to implement manufactories of all kinds, for which the market is at the door. A long list of profitable industries might be given, but want of space forbids, while the capitalist is at no loss to determine what branch of business would best suit him and such a country as we describe.

In conclusion, we invite all working men who wish to better their condition, to come west, and especially to come to Gentry country, Missouri.—*Stanberry Herald.*

HOWARD COUNTY.

We have thought it would be of interest to our readers, especially to those from abroad, to give a brief synopsis of the resources of our county, report its development in the various industries, and call attention to our advantages to those who are seeking homes.

We are indebted to Messers. Patterson & Brown, real estate and loan agents here, who have kindly furnished the following sketch and outline:

Howard county is situated in a large bend of the Missouri river, in about the center of the State, on the east side of the river. It has an area of 288,000 acres and a population of about 22,000. It is wholly a timbered county.

While there is a marked difference in the fertility of our soil, ranging from the inexhaustible wide Missouri bottom lands to the thin and broken white-oak lands, yet, excepting the bottom lands, there is a general uniformity of all the uplands, all of them being a clay loam, none of them being underlaid at any depth with a hard-pan and none of them having any stone or rock to interfere with the cultivation. It is this peculiarity and combination of our soil that to so large an extent makes us independent of the seasons. There has never yet been a season, at least for sixty years, that has been too wet or dry but that from 40 to 50 bushels of corn have been raised per acre on ground in clover sod, or on ground properly rotated and cultivated. In this connection it is proper to remark that situated as we are, in a bend of this large river, we do not have such extremes of drouth as other portions not so favorably situated.

Howard county is remarkably healthful. Our climate is much warmer than is indicated by the degree of latitude—the isothermal lines deflecting far to the north in the valley of the Missouri river. This gives us a mild winter, stock doing well much of the winter on blue-grass, on pastures not grazed down in the fall, while there are but few days in the winter that the farmer cannot carry on his farm work. Corn is never injured by the frosts. Wheat is sown from the 20th of September to the 20th of October, and even later. Oats sown in March. Corn planted from the first week in April till the 1st of June. Wheat harvest commences about the middle of June. Sheltered as we are in the valley of the Missouri river and by our forests gives us a more uniform climate or less violent extremes than other places less favored. We have never had a tornado or cyclone that has injured forests o r orchards or demolished buildings since the county was settled.

The timber is of all the different varieties of oak, with elm, linn, black walnut, ash, hickory, hackberry, locust and maple.

Howard county is remarkable for its wide range of productions, not simply those that can be grown, but more particularly that so many can be grown in perfection. This arises from the happy combination of our clay loams. Few soils indeed will produce with certainty the very best crops of corn, wheat, all the different varieties of grass, and apples, not only in quantity, but also in quality. This can certainly be said of Howard county. This has given to our farming operations a more marked character of mixed husbandry than most any other portion of our country. In addition to these leading crops, vegetables, such as cabbage, sweet and Irish potatoes, and all the small fruits, are easily grown and bear abundantly; especially is this true in the vicinity of Glasgow, a thriving town on the river in the western part of the county. The soil is from forty to sixty feet deep, very warm and fertile. Fruits and vegetables will ripen there two weeks earlier than here in the center of the county. No better place can be found for growing small fruits and vegetables to supply the great Northwest. In fact there are splendid openings on every hand where the unpaid labor and capital of other places can here reap a rich reward.

Wheat is our largest export crop. Large droves of cattle are annually fattened and exported. While there are few commercial orchards, yet this fall some 40,000 barrels of apples have been exported. The grass crop in its different varieties and uses is the crop of our county. Blue-grass for permanent pasture, and clover and timothy for meadows, all grow to perfection. Clover seldom winter-kills, and grows with rank luxuriance in our very thinnest soils. A large crop can be taken off for hay, and the second growth will yield a large crop of seed; at the same time the ground will rapidly increase in fertility. Timothy will yield heavy crops for years without re-seeding.

We desire to call especial attention to the apple crop, because it should be one of the foremost industries of our county, and because our resources for this branch of farming are so poorly developed and really so little appreciated. There is no possible crop that will yield so large and sure returns, and especially on our cheap lands. We have 50,000 acres of bluff land that can be bought from $10 to $20 per acre, where the apple tree grows and bears in all its Eden glory. These bluff soils are mostly of the loess formation, and while they produce large crops of wheat, corn, oats and grass, yet for the apple they stand unrivaled for early, constant and long bearing and healthy trees, while the luscious fruit in color, size and quality compels the admiration of the connoisseur of this grandest of fruits. Lying as the lands do along the Missouri river, cheap transportation at convenient points can always be had. The most devout pessimist in his gloomiest moods can never dream of an over-production. With an apple belt of 600 miles wide by 1,500 long, the world is at our doors for this crop. We will only instance two of the many sales of apples this year in our county:

Estate of Aaron Stanley, 13 acres, sold 870 barrels at $1.50 per barrel; total, $1,305—this on land worth $20 per acre. A. McCrary sold 200 trees for $300, purchaser taking them on the trees; 2½ acres, worth $15 per acre. Both of these orchards were of the Ben Davis variety. A reasonable fortune awaits any one who will embark in this business and give it reasonable attention. On these lands orchards of Ben Davis apples will begin bearing the second and third year from planting, and bear continuously.

Howard county is emphatically a stock county. For fifty years blooded stock have been imported into our county, and gradually won their way among farmers, till now the scrub is an extinct race. While the greatest attention has been given to improving the cattle, yet all kinds of stock now distinctly show the qualities of the different varieties of the thoroughbred. Several fine herds of thoroughbred Shorthorn, Hereford and Polled-Angus are owned here, and their lordly and queenly representatives adorn our blue-grass pastures all over the county.

The different breeds of blooded horses are represented here by the finest animals that money can purchase. Large numbers of mules are annually raised from the finest imported jacks. In cattle, beef has been the objective point, and consequently the dairy cow and dairying have received but little attention. So fixed is this idea among our farmers that it will be a long time before the dairy interest will receive any marked attention. Our last year's assessment shows: 5,340 horses, valued at $214,200; 2,540 mules, valued at $111,770; 16,775 cattle, valued at $211,805; 97,762 sheep, valued at $16,190; 24,068 hogs, valued at $52,115.

The bonded indebtedness of our county is, in round numbers, $218,000. Of this $60,000 has been called in and the money on hand to pay it; $26,000 has been paid off in the last two years. In the meantime our county has built a new court-house, at a cost of $47,000. No better index to the character of our people can be given than the fact that a proposition to build this court-house was submitted to a vote of the county; also at same time, if built, should county court issue bonds or tax the people and pay cash? With great unanimity our people voted to build, and at the same time voted to tax, and it was accordingly paid for as fast as completed. Seventeen years ago the bonded indebtedness of the county was $746,000. In this time it has been reduced as above stated. In five years more we confidently expect to extinguish the debt. Less than 10 per cent of the valuation of our farms is under mortgage.

Our county has always taken an active interest in education. Fayette school district last year built and equipped with all modern improvements a school building at a cost of $20,000. Against this proposition to build there was only one dissenting vote in the district. There are also located at Fayette, Central college for male students, and Howard college for girls, both under the control and patronage of the Methodist Episcopal church. The former has an endowment of $110,000 and property, in grounds and buildings, valued at $80.00C, and has an enrollment of 165 students. Howard Female college has a building valued at $30,000, and an addition is being built at a cost of $25,000. It has 160 enrolled students. It has no endowment, but steps are now being taken to have it well endowed. The moral and intellectual training in both these institutions is of the very highest order.

This county, besides being watered by the Missouri river on over half of its boundary, has two railroads. The Missouri, Kansas & Texas passes through the center of the county and through Fayette, and the Chicago & Alton, through the northern part of the county. Both roads are doing a large business, and, with the river, afford good facilities for shipping.

To all who are seeking homes in a mild climate, cheap farms, with a homogeneous and warm-hearted people, we extend the heartiest welcome.—*Howard County Advertiser.*

MARION COUNTY.

BY DR. J. N. COONS.

Marion county is situated in the northeastern part of Missouri, with a frontage of nearly twenty-five miles on the navigable Mississippi river. It is in the direct line of the eastern and western travel and trade, as shown by its two railroad bridges across the Mississippi river, one at its commercial metropolis, Hannibal, in the southeast, and one in the northeast, opposite the city of Quincy, Ill., and by the further fact that from these two bridges the lines of railroad converge to meet in a central point at its county seat, Palmyra, whence a main line, the Hannibal & St. Joe, runs westward to join the Pacific roads across the continent. In addition to its navigable water frontage, Marion county has about seventy-five miles of railroad, whilst many of its principal highways are already graveled and others in process of being graveled.

Marion county is one of the most fertile counties in the State, or indeed in the United States. Its far-famed "Elm lands plateau," coursing through the central part of the county from north to south, immedietely adjacent to several miles in width of rich alluvial bottom lands, has given the county almost a national reputation for unexampled fertility. Although the drouth of last year was unprecedented, reducing the general average of crops one-half to two-thirds, yet there were some fields of wheat in this section producing thirty to forty bushels per acre, and of corn yielding eighty bushels per acre, whilst also there were immense yields of timothy and clover hay, of apples, peaches, pears, plums, grapes and other fruits.

West of the elm lands plateau is a fine undulating and diversified timber and prairie country, with a soil well adapted to the growth of the same cereals and fruits, with a peculiar adaptation to the growth of the finest tobacco and blue-grass. Though not so fertile as the elm lands or bottom lands, yet its soil under the same tilth is far superior in productiveness to the average eastern lands.

Very fine varieties of oak, walnut, cherry and hickory timber, as well as many other less valuable kinds, abound throughout the county. A very large part of the county is underlaid with limestone rock, whose yield of lime and building stone of superior quality is second to none.

Some four large streams run from west to east through the county into the Mississippi. These, with their small tributaries and many supply springs, furnish abundant stock water for the large number of horses, mules, cattle, sheep and hogs raised by our enterprising, wide-awake farmers.

The entire county is well supplied with free public schools and churches, whilst we have at Palmyra and Hannibal some academic institutions of noted worth and learning.

Our county is free of debt, our farmers and people generally are in easy circumstances, our taxes light.

Palmyra, Hannibal and the many smaller towns vie with each other in the handling of produce and in catering to the wants of the people, not to mention the competition of the city of Quincy, Ill., just across the Mississippi, with two ferries and a railroad bridge to transport the rich trade of the county.

Our people are not surpassed anywhere for industry, morality, intelligence or hospitality, but we need double or triple our present population to develop our natural wealth and to open up the waste places and to further such manufacturing enterprises as shall meet our home wants. We cordially invite moral and industrious home-seekers. We want no drones. Come.—*Marion County Herald.*

MONTGOMERY COMNTY.

Montgomery county is located on the Missouri river, about 70 miles north of west of St. Louis, its boundaries extending on the north to within 30 miles of the Mississippi river, and has an area of 228,534 acres.

The face of the country is charming beyond description. The high rolling prairie of the northern and central divisions, alternating with beautiful valleys, with the wooded hills, table lands and low valleys and bottoms of the southern division, together with the numberless glades, intervals, ravines and clear, winding streams, that break the monotony of the woodlands, make up a landscape of unusual loveliness.

A mean elevation of 700 feet above the level of the sea, and the high, open, rolling prairie districts on the north and west, together with the natural drainage, give comparative freedom from malaria.

The southern part of the county is hilly, timbered land, and has a number of streams running through it, the valleys of which and the Missouri bottom are exceedingly fertile and productive. The soil is varied, the bottom land in places being nearly pure sand, other places stiff gumbo, and others sand, loam and gumbo mixed, which is the best. The hill land is a clay loam, limestone cropping out in places. The valleys are rich alluvial soil from two to ten feet deep, and rank with the most productive soil in the world. Last year in this section the greatest yield of wheat in the world was produced—seventy bushels per acre. No such yield of this grain was ever before known, and this is cited to show what the soil of the valleys of the southern part of the county may be made to produce when properly cultivated.

This section also produces heavy yields of corn and small grains, and immense numbers of live stock are annually fed by the thrifty farmers of Loutre and the Missouri river valleys.

This portion of the country is famous for fruits of all kinds, both large and small varieties, apples flourishing in a remarkable degree. Judge Samuel Miller, of Bluffton, who is recognized authority on horticulture, writes:

"I have seen as large Newtown Pippin, Ben Davis, Jeniton, Rome Beauty and Wine-sap grown on our river bottom lands as can be grown in the United States. On our hills the fruit does not attain so large growth as on the low-lands, but the color is richer and the flavor better. I have grown here on the hills, 150 feet above the river, such Northern Spy, Newtown Pippin, Jonathan and Rhode Island Greening as would delight any lover of fine fruit. When I send specimens to the Horticultural Art Journal (the best illustrated one in the country), the editor says that 'the fruit sent by Judge Miller is so far superior to the common grown that it is hardly recognizable.' For small fruits there is no fail if the grower does his duty. Peaches and pears thrive unless hard winters and blight interfere."

It was in the vicinity of Bluffton that the famous Capt. Jack, one of the best varieties of strawberries on the continent, was originated by Judge Miller.

There were over 500 barrels of apples shipped from this immediate section last year, besides what was sold in the home market and kept for home consumption.

Other portions of the county also produce fine fruits of all kinds, and, while they are not up to Judge Miller's standard, they are excellent both in quality and size when given proper attention.

The native forest, which originally covered 65 per cent of the county, and is confined principally to the southern portion, is rich in oak, ash, walnut, hickory, sugar and white maple, sycamore, and other less valuable varieties. Immense quantities of white oak for ties and railroad timbers, and sycamore for tobacco boxes, are annually got out in that portion south of Montgomery City and Minneola.

There is no end of building stone within two to five miles south of the railroad, gray and cream-colored limestone predominating. Within a few miles of the railway, gray granite, which polishes like marble, is also found in quantities supposed to be inexhaustible.

Seven miles south of Montgomery City are the famous life-giving waters of the celebrated Minneola springs. There are some half dozen springs here, only one of which has been tested. Some remarkable cures have been reported, resulting from the use of these waters, and such diseases as dyspepsia, indigestion, sick headache and derangement of the kidneys and stomach are said to be almost invariably relieved by the free use of these waters.

The southern part of the county produces some of the best qualities of tobacco, a crop that seldom fails when proper attention is given to its cultivation. And a good market for it is furnished at the farmers' doors by the Brown Tobacco Co., of Montgomery City, which is always buying in the market and pays the highest prices.

The prairies have a surface of alluvial soil from five to thirty inches deep. The subsoil or clay, sometimes called hard-pan, is composed largely of silicious matter, lime and magnesia carbonate, phosphates and organic matter, and slakes like quicklime on exposure to air and frost, holds moisture and manure with great tenacity, and will endure great excesses of rain and drouth without material injury. It is absolutely indestructible, and forms the finest known basis for grains, fruits, grasses and vegetables.

Here are produced wheat, flax, oats, corn, the latter in greatest abundance, and all kinds of grass. Blue-grass grows spontaneously, furnishing the finest early pasturage for live-stock. Wheat in this part of the country yields from ten to thirty bushels per acre; oats, thirty to sixty and eighty, and corn thirty to seventy. Timothy produces an abundant yield, and white and red clover grow luxuriantly.

This section is devoted largely to raising live-stock, nearly every farmer feeding more or less cattle and hogs. Horses and mules also enter largely into the business of the agriculturists, and many of the best bred horses in the State are to be found within the borders of Montgomery county. The old scrub breeds are fast disappearing and the live stock industry becoming the leading one and the pride of great numbers of the people. There is no vacant land in this part of the country. It is all under fence and much of it divided into small farms, and nearly every farmer is a stock-raiser. It is estimated that about 1,500 car-loads of stock have been shipped out of this portion of the county during the past year, bringing the producers an immense sum of money.

The assessment for 1890 gives the number of live stock in the county as follows: 6,635 horses, valued at $232,036; 2,089 mules, valued at $79,807; 18,826 cattle, valued at $181,956; 29,031 hogs, valued at $32,751. The total taxable wealth of the county is about $4,000,000.

A very large portion of the northern part of the county is underlaid with bituminous coal, and thousands of acres extending from five miles west of Montgomery City, and about the same distance from Wellsville to the vicinity of Middletown on the north and Gamma on the east, a distance of twelve to eighteen miles, are not only rich and fertile lands on the surface, but have untold treasures in coal under the ground. Coal is found at a depth of five feet to 100 feet, and veins of thirty inches to sixteen feet have been opened. The sixteen-foot vein is in the vicinity of Middletown, and has not been developed sufficiently to ascertain its full extent, although enough has been mined to prove the quality to be excellent. Superior cannel coal has also been found about the thick veins of the bituminous article. The bituminous supply is thought to be practically inexhaustible. It has only been developed about Wellsville, where it supplies an important coaling station for the Wabash railway.

An exhaustless supply of fire-clay has been found at Middletown, and at a point between Jonesburg and High Hill, and companies are at both places developing it. At Middletown it is being used in the manufacture of a superior quality of pottery, and at Jonesburg a company is under contract to furnish the Wabash forty car-loads per day for ballast for the road-bed.

It will thus be seen that Montgomery county is not only rich on the surface in timbers, agricultural and horticultural products, but has a mine of wealth underground in limestone, granite, coal and fire-clay.

The transportation facilities are also good, the county being traversed through its center from southeast to northwest by the great Wabash railway, one of the best and finest equipped roads in the west. The southern boundary is washed by the Missouri river, which gives water rates during three-fourths of the year, and just across the river is the Missouri Pacific railroad, which furnishes transportation all the year round, while the Cleveland, St. Louis & Kansas City is in process of construction from Alton to Kansas City, to run up the Missouri river valley, and is already in operation some twenty miles in St. Charles county.

There are 108 school-rooms occupied in the county, employing a like number of teachers. There are 5,796 children of school age enumerated, of which there were during the last year 3,907 enrolled in the schools. The value of the school property in the county is estimated at $81,990. The school expenditures are $27,191.45.

The permanent county fund is $8,939.26; permanent township fund, $16,369.82; State fund last year, $5,224.65; average levy, 45 cents; average cost per day of pupil, 6 cents. The salaries range from $125 per month down.

The schools run for six months in all the districts, and in many of them longer. The public school building in Montgomery City is one of the best to be found in the State, handsome, commodious and new, and the school itself stands in the foremost rank of graded schools throughout this State of good schools, furnishing an excellent opportunity to young persons who desire to teach to equip themselves for this responsible work. There are nine teachers in this school, and the graduating class this year numbered fourteen. Wellsville also has a graded school, and a number graduated at the close of the school in April.

Among the individual enterprises of a nature that benefit the public may be mentioned the Montgomery roller-mills at Montgomery City, with a capacity of

150 barrels of flour per day. There are also roller-mills of a smaller capacity at Americus, High Hill and Wellsville; a box factory at Montgomery City; a tobacco factory at Wellsville, with a capital stock of $20,000 to $30,000, which makes a considerable output of manufactured tobacco; the Brown Tobacco company at Montgomery City, with a capital stock of $100,000. It employs over 200 hands, and last year manufactured nearly 1,200,000 pounds of tobacco, paying the government a revenue of about $90,000. Robertson's wholesale and retail hardware, implement and carriage establishment at Montgomery City, a creamery at New Florence, and numerous smaller commercial institutions all over the county.

There are six banks in the county at convenient places for the transaction of all commercial arrangements: One at Middletown with a capital stock of $6,000; one at Wellsville with a capital stock of $15,000; one at New Florence with a capital stock of $10,000; one at Jonesburg with a capital stock of about $8,000, and two at Montgomery City, one with a capital stock of $16,000 and the other with a capital stock of $25,000.

Montgomery county is free from debt, and while the population is scarcely 20,000, there are two court-houses, both paid for, one at Danville and the other at Montgomery City, the latter among the finest on the Wabash railway.

The intelligence of the people may be indicated by the fact that there are eight papers sustained in the county, all of which, according to the estimates of the publishers, have mammoth circulations.

From this brief statement of some of the advantages of this county, it will be seen that she possesses far more than ordinary attractions to the immigrant who desires to engage in farming, stock-raising, coal-mining or commercial pursuits. And to all such honest citizen-immigrants, Montgomery county extends a cordial invitation and a hearty welcome—*Montgomery Standard.*

SALINE COUNTY.

The county of Saline is a pride, not only to the people who are so fortunate as to inhabit it, but to the whole commonwealth of Missouri. It lends its magnificence to the counties which surround it.

The county has an area of 735 square miles, or 470,400 acres, and its place on the map is near the center of the State, on the line of Washington, Cincinnati and Kansas City, about 80 miles east of the last named city. It is 200 miles distant from St. Louis and 394 miles from Chicago. To each of these cities its people have easy access both by river and by rail. The Missouri river (or Big Muddy as it is commonly called) borders the county for 90 miles along its eastern and northern border, and that great trunk line, the Chicago, Alton and St. Louis railway, traverses the center of the county from east to west.

Saline county is everything that could be wished to the agriculturist. Its soil is deep, dark and alluvial. It is in the great bend of the Missouri river, and has all the richness of the noted bottom lands which geological investigations prove that it once was. There is no more productive soil on the face of the globe, being rich decayed sediment, which is the wash of ages, from five to fifteen feet in depth. The rain-fall in this county rarely fails to be distributed equally, and at intervals frequent enough for the wants of all cereals grown in the temperate zone.

Its drainage is natural and the best that could be conceived. The surface of the land is rolling and undulating. The physical structure of the soil is such as to withstand any possible drouth. It is open, porous, and beneath a sandy sub stratum which acts in the capacity of a sieve—withdrawing the moisture when there is a surplus, and returning it again in time of drouth. There is no hard-pan under the soil of Saline county. The avenues which allow moisture to rise insure good crops in any season, wet or dry, and leave the surface of the land everywhere free from swamps and stagnant pools, making it an extremely healthy country and entirely free from malaria.

Not only has Saline county the best agricultural advantages in the State, but it is a marvel for its mineral resources. It is from the great salt deposits and springs that the county takes its name. Coal, lead, zinc, fire-clay, and everything necessary. Geological surveys have proven this county to have a strata of coal underlying it which would be sufficient, if developed, to supply the whole State of Misouri. So far, just enough coal has been unearthed for local needs, but it will not be long until the increasing population and capital will go down after some of this great wealth.

This brief review of Saline county would be grossly incomplete, should the great stock-raising industry be not mentioned. The noted blue-grass fields of Kentucky find formidable antagonists in Saline county. For pasture this county is unexcelled. All the tame grasses grow luxuriously.

The immense crops of corn and hay make cattle-raising very advantageous. Thousands upon thousands of cattle are shipped out of this county to the Chicago market each year.

Fine horses, sheep, hogs and mules are also an extensive and profitable property.

The reason Saline is not the banner fruit county in the State is that fruit-raising has been up to the last few years neglected. The immense fruit crops of the last two years have convinced every farmer of the great profits to be derived from it, and consequently many land-owners are turning a great portion of their attention to the nurture of orchards and vineyards.

Saline county has upward of 30,000 people, and ranks ahead of any rural county in the State in amount of taxable wealth.

Marshall, the county seat, is situated near the center of the county, and is crossed by the Boonville & Lexington branch of the Missouri Pacific. Marshall has about 4,000 people, is a good county town, and equal to the grand county of which she is a capital.

Slater, the next largest town in the county, is situated in the northeastern part, twelve miles from Marshall, and will in a few years be one of the finest cities in Central Missouri. It will be the greatest railroad and manufacturing center along the Missouri river. The city was founded in 1878. In 1882 a writer passing through on the Chicago & Alton, styled Slater the "infant wonder." At that time, after the town had been in existence only four years, the same writer says: "In two years there have been four hundred and twenty houses erected at a cost of $550,000." The city has grown during the ten years since that time in the same proportion. Slater has the division headquarters of the Chicago & Alton railroad, which distributes from $20,000 to $25,000 each month in the city. Another of her principal industries is the roller mills. The Slater Milling company ships flour and feed to all parts of the United States. Many Texas towns depend entirely upon the Slater mills for their supply of flour. The city has electric lights and a water supply, and is filled with all the modern conveniences of many cities twice the size.

Sweet Springs is the next largest town in Saline county, and is famous as a watering place and summer resort.

Miami, Malta Bend, Blackburn, Gilliam, Arrow Rock, New Frankfort, Nelson and Saline City are the remaining thrifty little towns within the borders of this great county, ranging from 300 to 1,000 people each.

Land is worth from $35 to $60 per acre, and a man who is so fortunate as to own a farm in Saline county has a fortune indeed—*Slater Index.*

PHELPS COUNTY.

The area of this county is 469,163 acres. The surface is rolling, with high table-lands, broad valleys and creek bottoms, underlaid with limestone, with an occasional belt of sandstone.

The streams are very numerous and of good volume. The largest are the Gasconade, Little Piney and Meramec rivers. The soil on the bottoms is of a black mold, which is easily cultivated; the valleys are of a rich, dark sandy loam; on the hillsides and upper valleys a clay loam appears, which, to the fruit-grower, is of great value, and on the table-lands is a clayey soil, adapted to small fruits, such as strawberries, raspberries, etc.

The extremes of heat and cold are not felt here, the average degree of heat being 75°, the average degree of cold, 35° above zero, with a mean temperature of 52°.

The railway runs through the central portion of the county, and the company have about 46,000 acres of land lying within six miles on either side, ranging in price from $2 50 to $7.00 per acre. This is a limestone region, traversed by innumerable streams, formed by more numerous springs, which are marvels of plenty and capacity, some of them being utilized as power for grist and saw-mills.

The timber, while not heavy, is ample for all the wants of the people, oak of every variety being the principal growth on the highlands, while in the bottoms and valleys are found walnut, hickory, maple, mulberry, sycamore, plum and pawpaw.

The bottoms are rich in alluvial deposits, while the soil of the ridges is diverse and more uneven in quality—in places being deep, rich and productive, in others thin and rocky. The most part is either sandy or gravelly clay loam or mulatto. Under good cultivation it is susceptible of producing every cereal or root grown in the Union.

According to a census taken in 1885, there were in Phelps county 35,000 acres in cultivation, giving an average yield per acre of corn, 25 bushels; wheat, 15; rye, 15; oats, 30; potatoes, 75; hay, 1½ tons.

A better fruit country can scarcely be found. Apples, pears, peaches, plums, cherries, grapes, aud all the various berries, grow rapidly and bear in the greatest abundance. Grapes, though some years subject to rot, do wonderfully well, and there are large wine-making vineyards among the German settlers. The thin soil of the poorest ridge side will produce most prolific vines, and on such are found some of the best vineyards.

To grasses of every variety thus far tried, the soil seems unusually well adapted. Timothy, blue-grass, Hungarian grass, millet and clover all grow luxuriantly.

Stock-raising is fast being entered upon by our more enterprising farmers, and is proving to be a more profitable branch of farming than any other. The forests in all directions are abundant in grasses, and stock turned out to commons, or on the "range," here called, in early spring seldom fails to be fit for the butcher by July.

There are two large wagon factories in Rolla doing a fine and growing business. Grist and flouring mills are scattered numerously and conveniently throughout the county, there being eight in Phelps county alone. One at Rolla has a present capacity of 400 barrels of flour every 24 hours, and two additional stones are about to be added. Another at St. James, ten miles east, is nearly as productive.

Rolla, the county seat, the chief town of south central Missouri, is a city of 2,500 inhabitants. It has a mercantile business equal to that of most places three times its size. It has a fine and commodious court-house of brick, jail, city hall, five hotels—two first-class, two which cost $20,000, one woolen factory, eight churches, two newspapers, besides numerous stores and shops.

Of our educational facilities, we show a record of advancement of which we are proud. In 1860 there was not an organized school district in Phelps county, and but little interest taken in the few private schools then existing. Now we have 74 organized school districts, each with a comfortable, and some with really fine school-houses—the total scholarship being about 4,350, or an average of 68 to the district. At Rolla is also located the School of Mines and Metallurgy, a branch of the State University. It has six professors and assistants, and most of the higher branches of study are pursued. The school building is a beautiful structure and cost $30,000. It is provided with apparatus and equipment, including laboratory and engineering and surveying instruments, that cost $22,000, and has a library of 1,858 volumes. The expenses of education for school term of 42 weeks are $20, and board can be obtained at from $12 to $16 per month.

Nearly every school-house is a meeting-house as well, and larger villages have commodious church edifices. There are societies of Presbyterians, Catholics, Baptists, Methodists, Episcopalians, Christians and Adventists. The first five named have fine church buildings at Rolla.

The population of the region under description is very uniformly distributed. Phelps county, which has an area of a little over 700 square miles, and contains 449,280 acres of land, has a present population of about 13,000 souls, a thoroughly mixed people, there being residents from nearly every State in the Union, with a large population of Germans.

Phelps county is situated in the heart of the far-famed stock-raising and wheat-growing section of south central Missouri, having direct connection with St. Louis, 111 miles distant over the St. Louis & San Francisco railway.

The county is well watered by numerous springs, creeks and streams.

The climate is exceptionally healthy, pulmonary diseases being entirely unknown, except old chronic cases imported, and such are invariably benefited by the climate.

Timber is oak, of the various kinds, hickory, hackberry, etc.

It is the best stock-raising and wheat-growing county in the southwest. Good schools and school-houses throughout the county.—*Rolla New Era.*

WEBSTER COUNTY.

Southwest Missouri, climate and healthfulness considered, has been long and widely famed as a favored place. Webster is one of the group of counties embraced in this section, and of her it may be truly said: "She leads them all." Webster county was organized in 1855, and is situated in the southwestern part of the State, thirty-seven degrees fifteen minutes north latitude, and fifteen degrees and forty-five minutes west longitude from Washington. It is bounded on the north by Laclede and Dallas counties; east, by Wright; south, by Douglas and Christian, and west by Greene, and has an area of 380,000 acres. Marshfield, the county seat, is 213 miles from St. Louis, on the St. Louis & San Francisco railroad. It is a thriving town, and, situated on a beautiful prairie that crowns the Ozarks, is, by virtue of its charming location, substantial evidences of thrift and the enterprise of its citizens, fully entitled to be known as the "Gem City" of the Southwest. The highest land in the county, and, with the single exception of Pilot Knob, the highest land in the State, is close to Marshfield. The roof of the court-house marks the dividing line of the ridge, the rainfall on the northern side flowing north to the Missouri river, while that on the south finds its way to the White river.

From Marshfield the surface slopes gradually off in every direction, presenting in its physical features an elevated table-land, lying from fourteen to fifteen hundred feet above the sea level, broken by valleys in which are rich and productive bottom lands, and through which flow lasting streams of the purest water, with broad stretches of comparatively level uplands intervening, the upper part of which are well timbered, and with a soil varying in quality from the deep black loam of the bottom to the thinner and in places stony surface of the uplands, our county presents many contrasting features. Although Webster county occupies the summit of what is geographically known as the Ozark mountains, it is not a mountainous country, and the Ozarks are mountains only in name, being in fact a range of hills, possessing only the mountain features of pure air and sparkling water. Within the memory of many of our oldest settlers, this country was prairie, and so remained until the summer fires were stopped, and then the timber came, and now but a few patches of prairie remain and it is rightly classed as a timber country. No feature of the county speaks better for the strength and richness of the land than does the timber, which, coming spontaneously, has in so few years covered the face of the earth with a magnificent growth of oak, hickory, walnut and kindred varieties. Poor land could not produce such a growth. Another feature worthy of attention is the fact that our lands do not wash to any extent.

The lands in this county may be divided into two classes, agricultural and grazing. The agricultural lands may be divided into three classes: First, the bottom lands, which are probably the richest, lie along the water-courses and in the valleys. These lands are very rich and productive, and will yield, with proper cultivation, from 40 to 80 bushels of corn, 40 to 70 bushels of oats and 20 to 30 bushels of wheat to the acre. Another class of lands in this county is what is known as "barrens," and in point of value and in productiveness are almost, if not fully, equal to the bottoms. They are covered with a growth peculiar to the bottom lands, such as red and black haw, hazel, sumach, wild cherry, wild plum, grapevines, etc. The soil is a dark mulatto, very rich and productive, and to some would be more desirable for the reason that it is not subject to overflow, as is sometimes the case with the bottoms. The other kind of land is known as "post-oak, black-jack and black-oak flats." These are, of course, uplands, and, in the opinion of many, are destined within a few years to become the most valuable lands we have. With proper culture they will produce good crops of small grain, are considered our best lands for grass, and are not excelled anywhere for fruit-growing. Of course, the soil of the bottoms is an alluvial deposit; above the bottoms it is all a limestone formation, and exceedingly rich in its "staying" qualities.

The climate is a most attractive feature; the summer season is long, the heat never oppressive and the nights always cool. The winters are short and mild, the mercury seldom going below zero and the snow remaining but a few days at the longest. Unlike many sections of this Western country, we are not troubled by the wind; no howling blizzards, driving their freezing breath into one's very marrow, and forcing a fight for life, before which so many stout hearts have ceased to beat; no scorching summer winds, reaching out their fiery tongues to blast and wither in a moment the fairest prospect, and no prairie "zephyrs," whose ceaseless pressure forces the growing trees to an angle that distorts the face of nature, robs the orchard of any chance to fruit, and makes the life of the dweller on the "beautiful" prairies miserable on account of the continued unrest and disquiet which it occasions. Our summer nights are especially worthy of mention. They are never so warm but that a slight covering is comfortable, and with the entire absence of mosquitos, the sleeper always gains a refreshing rest. Our elevation is a perpetual guarantee of pure, dry air, and no reason exists why this country should not become famous as a health resort. Certain it is that the ratio of deaths is less and the average of life longer than in many other localities. There are absolutely no malarial diseases, and man and beast alike are practically exempt from all forms of epidemics. We doubt if a more healthy section can be found in the United States.

A glance at the small map, which we publish herewith, will, we think, give abundant evidence in support of our claim, that Webster county is the best watered county in Missouri, and its equal in this respect can hardly be found anywhere. The Niangua, the Osage, the Pomme de Terre, and James, all considerable streams, have their sources in a section of which Marshfield is the center. The Findley rises further south, and with its branches, waters much of the southern part of the county. All of these streams are supplied by springs, one or more of which can be found on almost every quarter-section in the county. Of course the water of all of the springs is not soft, but it is the case with a majority of them, and in every case the water is as clear as crystal and entirely devoid of that milky, bluish tint which is common to the water of many other sections Webster county is within the rain-belt, the annual rain-fall averaging thirty-five to forty inches, and being well distributed throughout the season.

The staple productions include all of the products of the soil grown in temperate climates and many semi-tropical productions, beside live stock and wool. Corn gives a yield of forty to seventy-five bushels, wheat from sixteen to thirty-five and oats from twenty-five to seventy-five per acre, according to the season, soil and cultivation.

The tobacco grown in Webster county is noted in the St. Louis market as being the finest raised in the State. Considerable attention is paid to its cultivation, and its growth is likely to be greatly extended, since both climate and soil seem especially to favor it.

Every year increases the interest that is taken in fruit culture. It is a natural fruit country; elevation, latitude, climate and soil all combine to give the most perfect development to the apple, peach, pear, plum, cherry, grape and the whole range of small fruits. One item of great importance in this connection is the fact that apple trees will come into profitable bearing the fourth year from the nursery stock, and other varieties in the same proportion. This is one-half the time that is required in more northern locations, where the shorter season limits the growth of the wood.

Many varieties of wild grass, all of more or less value to the graziers, grow luxuriantly in the valleys, on the hill-sides, through the wood-lands, everywhere, affording through a long, open season an abundance of most nutritious herbage. Blue-grass thrives as though "to the manor born," and "comes in" wherever the wild grass yields to close grazing. Of clover, one of our largest land-owners enthusiastically says: "It is the best clover country on earth." Give clover a start, and undisturbed, it will continue itself indefinitely. Land that can be bought at prices lower by far than the ruling prices in sections where clover can not be grown at all, will here produce from two to three tons of hay to the acre.

The luxuriant growth of grasses and open range, the cheapness with which they can be raised, short and mild winters, abundance of water, protection afforded by timber, freedom from disease, nearness to market and cheap lands, make this a superb stock county, and for this purpose greatly superior to any that can be afforded by the great plains further west. The raising of blooded stock could be carried on here most profitably; as it is, horses, cattle, sheep and hogs are raised in large numbers.

The climatic conditions of the country seem especially favorable to their health, and they are raised so cheaply that our farmers all understand that attention to stock puts more money in the pocket than any branch of their business to which they can give attention. The raising of mules is a matter deserving special notice. Perhaps no branch of the stock-raising interest brings more money into the county than do the mules. From weaning time up, mules are considered as good as the cash. The big prices which they bring, and the ready sale which they command, make their raising a favorite industry. There is no herd law in force in the county, except such as restrains the running at large of male brutes. A legal fence must be five feet high, with corners locked, and any animal that forces such a fence is considered breechy, and the owner is liable for damages.

Webster is a timbered county. On nearly every quarter-section there is a sufficiency to keep the buildings and fences in good repair, and for all other purposes needed on the farm. Walnut, hickory and oak of the different species common in this latitude, buckeye, sycamore and elm, redbud, pawpaw, sassafras, mulberry, persimmon, elder, hazel, plum, sumach and dog-wood, and almost everything in the small fruit line are indigenous, and together form a variety that can hardly be exelled in any country.

Fuel, which in a prairie country is a matter of the greatest importance, is here a question of no concern. Every farmer has it at his door, as it were, and the roaring fires that may through the winter season be found in the broad fire-places of our country homes, contributing so much to the comfort and health, contrast glowingly with the economical consumption of the coal, corn, hay, stalks or cow-chips from which the dwellers on "the beautiful prairies" are obliged to coax the warmth absolutely necessary to the preservation of life.

Good building stone is easily and cheaply quarried from the deposits of limestone, sandstone and cotton rock to be found in almost every township in the county.

Lead, zinc and iron have been found in considerable quantities, and men well informed on such matters declare that capital is all that is needed to develop these in paying quantities.

Throughout the county game is not nearly as plentiful as formerly, and yet it is estimated that last year the amount of money brought into the county on account of the sale of game shipped out was equal to the whole amount of taxes paid during the year. The list of game includes deer, turkeys, quails, ducks, geese, rabbits, squirrels, etc.

Webster county affords a most inviting field for successful and profitable bee-keeping. Our long seasons of pleasant weather, dry atmosphere, great abundance and large variety of plants affording suitable food for honey, all contribute to make the work of the apiarist pleasant and profitable. As compared with some sections of country, what is done in the line of honey production here is small, but there are many farmers throughout the county who take a deep interest, and several whose hives will number more than one hundred.

The population of the county can not be far from 16,000. It is made up of natives of almost every State in the Union, with an exceedingly small percentage of foreign-born, and a negro element the total of which hardly numbers one hundred.

Our people are law-abiding, and all personal and property rights have full security. There is no disorderly element; the people are honest and moral, and their hospitality is proverbial.

Marshfield has a population of something more than one thousand. Being the county seat, it contains the court-house and jail, both substantial buildings, and has, besides, five churches, two public schools and many substantial and handsome business houses and homes. It is one of the handsomest little cities in the State, full of business life and enterprise. Seymour, second in size, is on the Gulf road, and is a booming town. Fordland and Rogersville are also lively towns on the Gulf road. Henderson and Waldo are pleasant inland towns with well-conducted academies.

Northview and Niangua are stations on the Frisco road; both do a considerable business and are growing in importance. Every settlement in the county is steadily increasing in size.

Church organizations exist in almost every town and hamlet in the county, and the different denominations are well represented, affording all who choose to accept abundant opportunity for public worship.

The county is divided into upward of seventy school districts, all of which possess good school-houses, in which school is taught from four to six months in the year. In addition to the district schools, the Marshfield school and the academies at Waldo, Seymour and Henderson afford first-class educational facilities; in each, school is maintained for a longer period than at the district schools.

There are in the county six Masonic lodges, viz.: At Marshfield, Henderson, Niangua, Warden's Station, Mt. Olive and Seymour. The Odd Fellows are represented at Marshfield, Henderson and Seymour. The Grand Army of the Republic has posts at Marshfield, Rogersville, Fordland and Seymour.

The political situation in this county and section has been greatly misunderstood. At the last election Webster county went Republican by a decided majority. The fullest liberty is given to political discussion, and men of all parties exercise here their every political right with a degree of safety that could not be exceeded if performed under the dome of the capitol at Washington.

The county is out of debt. All needed public buildings, including court-house, jail and the buildings on the poor farm, are built and paid for. The taxes, including county, State and road, are at the rate of ninety cents on the one hundred dollars, the assessed valuation being about one-half of the actual valuation.

A glance at the map will show the two railroads—the Frisco and the Gulf—which pass through the county. A third road is projected and will probably be built before many years. Every portion of the county is, by these roads, made easily accessible to market.

The cheapness of land here can be explained by many reasons, among which are the following:

There is yet a large body of unoccupied land in the county which can be purchased at low prices, and this low-priced land regulates, in a measure, the price of the remainder.

The county has never been advertised, as have higher priced but more distant and naturally less favored localities.

Immigration has been retarded by the unreasonable prejudice existing among many in regard to the State, and by the idea unfortunately prevalent in other sections that strangers are not welcomed by our people.

The term mountain applied to this section is very misleading and has deterred people from coming here, because of the general idea of roughness and sterility which it conveys.

A large number of improved farms are yet in the hands of persons who homesteaded them, and who, in the absence of any boom to inflate prices, naturally value them less highly than they might do had they acquired them in a more expensive way.

Why are so many farms offered for sale? In answer to the above inquiry, which is often made, we ask the questioner to remember that a large class of our people are, in their spirit of unrest, virtually frontiersmen, and, like them, always ready to sell out their present belongings and seek new homes in a country further west, where, untrammeled by the ways of an older civilization, they may find, in their imagination at least, a country and a community better suited to their roving natures.

The approach to Marshfield by rail from either direction is on the divide, and gives one but a poor idea of the country. Our roads are not well worked, and as a whole our buildings are neither imposing nor expensive. To one accustomed to a prairie country, our country is not at first sight always inviting, but never fails to improve upon acquaintance. We do offer cheap and productive land, the best of water, a healthy location and a delightful climate, and we assure those who desire to share with us these advantages a hearty welcome.

The history of the famous Marshfield mineral springs, prior to the spring of 1880, is a matter of some uncertainty, but early settlers claim that the main spring was well known and used when the county was first settled, and that the peculiar taste and effect of the water caused the people to avoid its use. For a time previous to 1880 no spring or water was visible except a marshy spot where a sediment of iron attracted the attention of one James Robinson, an employe at the mill of Barnes & Bollinger, a few yards distant. Robinson had for fifteen years been afflicted with sore eyes, and had tried all manner of remedies without receiving any benefit. Curiosity induced him to try the effect of the iron sediment upon his eyes, and he quietly continued the treatment for several days. His employer, noticing the improved condition of his eyes, inquired the cause, and being told, procured a spade and dug in the marshy spot, when a powerful spring boiled up and ran over the ground.

The incident created considerable excitement, and everybody afflicted with sore eyes made a trial of the water and without exception were cured. Persons afflicted with other diseases followed, with the most remarkable results. Rheumatism, piles, skin diseases, swelled limbs, old sores and kidney affections all yielded to the curative properties of this new-found healing agent. The water does not freeze as it runs to the creek in the most severe weather. It contains carbonate of lime, carbonate of magnesia, chloride of sodium, iron, chlorine and carbonic acid gas. A few years since a first-class bath-house was built, and a boiler, steam-pump and all the necessary appliances to make the water available for bathing purposes added. The springs are pleasantly located a half mile north of the court-house, and less than three-fourths of a mile from the depot of the Frisco railroad. Board at the hotels and at private houses is very reasonable, and persons so desiring can avail themselves of the benefits to be derived by the use of the water at a comparatively small expense.

A good hotel for the special accommodation of invalids is needed, and if erected near the springs and properly managed would pay big from the very start.—*Webster County Standard.*

FULTON, CALLAWAY COUNTY.

In North Fulton is located the Fire-clay works, owned and operated by the Dixon Fire-clay company. They keep in constant employment from fifty to one hundred workmen at a running expense of from $30,000 to $40,000 per annum. Large quantities of locomotive tiling which is shipped mostly to Chicago and Kansas City, all shapes of fire-blocks, fire-bricks and drain tiling, which is shipped to all parts of the county. They have plenty of water, coal and an inexhaustible amount of fire-clay right at hand, and the demand for their products is fully up to their productive capacity.

The Fulton flouring mills of the latest improved roller system, with a capacity of 150 barrels of flour per day, are located near the depot, and command a good trade.

State Lunatic Asylum No. 1 was located at Fulton in 1848, was opened for occupancy in 1852, and for many years was the only insane hospital in the State. The institution has been steadily growing, and to accommodate its increasing population has been improved and enlarged from time to time. Within the last year one entire wing has been removed and replaced with an elegant fire-proof wing, which is about completed. The hospital is abundantly supplied with the purest water, and is lighted with electricity. Its present number of inmates is 554.

The new addition covers an area of 50×100 feet, 4 stories high, with two large dormitories 25×30 feet long. The main corridors are 14 feet wide with 48 patients' rooms, 10×12 feet. The foundations are of stone. The front and end of this building is built of fine cut broken ashlar, 4 feet above the ground, and all the walls above are built of first quality brick laid in cement mortar. The roof is covered with approved slate, ornamented with spacious galvanized iron cornices. The floors are constructed with rolled steel beams, fire-clay and brick arches laid in cement, with 3 inches of concreting on top. The flooring throughout is of rift sawn, straight-grain Georgian pine lumber, finely polished. The doors and all interior wood-word are of yellow pine and cypress. There are iron doors to disconnect the old building. This building is absolutely fire-proof in every particular, and the finest of its kind west of the Mississippi.

M. F. Bell is the architect, and the well-known Anderson Bros., of St. Louis, are the contractors.

On the first Monday in November, thirty-nine years ago, the Missouri Asylum for the Deaf and Dumb was, under the superintendency of William Dabney Kerr and his admirable wife, opened for the reception of pupils. Its home was a small frame house devoid of conveniences; in vivid contrast to the present stately building, more appropriately called "The School for the Deaf and Dumb." Mr. Kerr made the education for the deaf and dumb his life work, building up a large and flourishing institution, and lived, enfeebled by age, to gaze one February night from his doorway upon the fire that consumed the large and commodious buildings; but he was mercifully spared to see them speedily replaced. By wise use of the insurance money, amounting to $65,000, together with a special appropriation of $93,000, the Board have been enabled to build the present handsome structure, which is fire-proof. The new school building and chapel is nearing completion, and will be dedicated next June, when a reunion of all the graduates of the school is contemplated. Two hundred and sixty-nine pupils are now in attendance, and the number is constantly increasing. There will be 335 pupils to report for biennial catalogue. The school is now under the able superintendency of Mr. J. N. Tate, and a corps of well-qualified teachers. Mr. Tate is enthusiastic in his work and is admirably qualified for it. We have never seen a school where the teachers evinced so much personal interest in the pupils, and where such affectionate respect was so generally shown by the pupils to both superintendent and teachers.

The trades and school are under a schedule that gives ample time for both. The work in the cabinet shop is deserving of special mention, while "The Record," issued weekly from the printing office, is, by the neatness and correctness of its columns, ample illustration of the improvement of the pupils. Good work is also done in the shoe-shop.

One has only to mingle for a time with the pupils to realize what a great work is being done by the teachers in articulation. The art classes have been opened for the first time this year. The promise in these classes is great; much interest is manifest in the pupils, while not a few show genuine talent. Since you can "develop a child's faculties by drawing better than by books, and no other study will so quicken his perceptions," it seems an especially appropriate study for deaf mutes. It will aid the boys in their carving in the cabinet shops, the printers in learning to illustrate, while it opens a new avenue of self-support to the girls, who have hitherto had only sewing and house-keeping taught them outside of the regular lessons. In short, the method of instructing the deaf in this school is as progressive as the age. Its graduates will be fitted for self-supporting useful citizens.

The management of the whole Institute by the Board has been and is especially wise, prudent and honest. Missouri may, and Callaway especially, be proud of its "School for Deaf Mutes."

Westminster college, an excellent institution of learning, has been doing its good work for nearly forty years, and many of the brightest and most successful men bear the impress of its teachings. Could we publish a list of the thousands who have received instruction within its walls, the records of good, useful and honorable testimony to the sterling worth of an institution that has quietly pursued its work, with no blare of trumpets, with no boasting, and with little advertising, but with an earnest purpose to merit the approbation of the thinking element of the people of Missouri. In the theological seminaries, the medical and law schools of the East, her students have made records that have established her reputation.

Westminster College is under the care of the Presbyterian Synod of Missouri a denomination with a membership of less than 12,000. Taking into consideration the size of the denomination, Westminster, with an attendance actually ranging from about 120 to 135, is the best attended denominational institution in the State, The buildings and endowment represent about $125,000, including the several scholarship funds. Besides twelve recitation rooms, the buildings contain the Y. M. C. A. Hall, the Hall for the Philologic Literary Society, the Hall for the Philalethian Literary Society, a gymnasium and a chapel capable of seating 750 persons. The ground composing the campus is large and is very valuable; none of it can be sold, however.

There are nine professors in the Faculty. The courses are four in number: the classical, the scientific, the literary and the commercial; the latter calls for two years' study, and on its completion a certificate is granted; in the other courses, diplomas are granted.

The friends of the college are now making an effort to add $50,000 to its endowment fund; and an agent is in the field and meeting with reasonable success.

Several years ago, our people raised $10,000 and presented to Westminster for a new building. There are no more enterprising and liberal people than the people of Fulton and Callaway. With one of the best business towns in the State, the people have made money and spent it liberally; within eight years they have raised for the Christian Orphan School, $56,000; for the Baptist Church, $8,000; for the Christian Church, $11,000; for the Presbyterian Church, $24,000; for Westminster College, $10,000—a total in eight years of $109,000, besides giving liberally to outside causes.

SYNODICAL FEMALE COLLEGE AND CONSERVATORY OF MUSIC AND ART.

This institution has entered upon its eighteenth year with the boarding department entirely full and the largest attendance it has ever had. There have been enrolled up to date, 23 in Intermediate school, 85 in College department, 70 in Music school and 17 in Art school. The school is composed of two large, plain but very convenient and substantial brick buildings, containing in all fifty-seven rooms. Both buildings are heated by steam, lighted by electricity, and supplied with water on each floor from the city water-works. The boarding department has handsome bath-rooms, and is furnished with beautiful modern furniture. The music school is supplied entirely with new pianos. The art school occupies the entire third story of the Conservatory building, and has been lately refitted with a large invoice of statuary, busts and casts of fruit and flowers. Each school is taught by a specialist and the very best talent that can be procured. For information and catalogue, address Rev. H C. Evans, Fulton, Mo.

THE ORPHAN SCHOOL OF THE CHRISTIAN CHURCH OF MISSOURI.

This old institution, recently relocated at Fulton, was opened for the reception of pupils the 10th day of last September. With a good attendance already, and having the support of a brotherhood numbering considerably over one hundred thousand in the State, it is certain to soon become one of the largest attended schools in Missouri.

The large and modern building, which is now almost completed, will be lighted with electricity and heated by steam. Bath-rooms on every floor furnished with hot and cold water. All rooms are large and light. But two girls in a room. The location is high, healthful and beautiful, commanding a magnificent view for miles in every direction. None but competent and experienced teachers are employed.

The courses of study are extensive, embracing ten distinct departments Four classes of young ladies are at present admitted into the school:

First class—Destitute orphans, who have no relatives or friends to aid them (called beneficiaries). This class is educated free of cost.

Second class—Orphans destitute of means, who have relatives, churches or benevolent societies to aid them, and are willing to sustain them at school; charged $70 per term of 19 weeks for board, tuition, washing and lights.

Third class—Orphans who have some means, but not enough to support them; received at $70 per term of 19 weeks.

Fourth class—Young ladies who have parents that desire to assist in the benevolent work of the school; received at $87.50 per term of 19 weeks.

Precedence is given to the first class, and as many of them are received as the proceeds of the endowment will justify. Out of the other three classes—giving precedence to the second over the third, and third over the fourth—the school will be filled to its capacity. Until the endowment fund is sufficient to fill the institution with indigent orphan girls, pay pupils will be received. Parents by sending here get not only the advantages of a first-class school, at a low rate, but aid materially in increasing the beneficiary class, since every dollar over and above the actual cost of keeping a girl is applied to the education of some moneyless girl.

For further particulars, or for a catalogue of the school, you are referred to Rev. Frank W. Allen, the President.

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